AMONG SCHOOL GARDENS



GREENE



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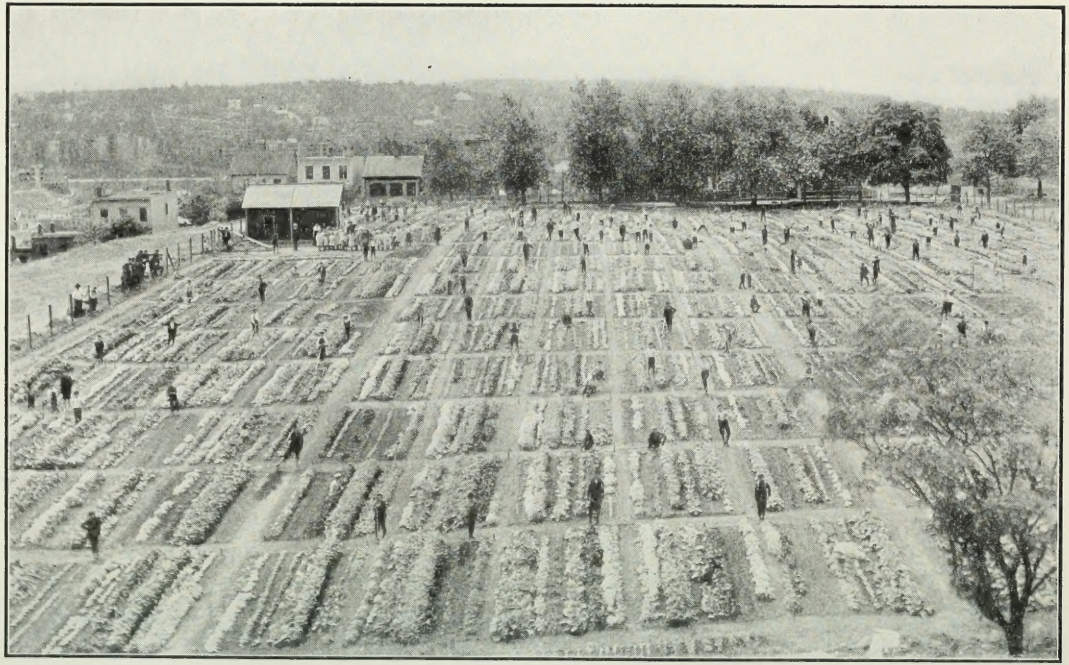
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AMONG SCHOOL GARDENS

BY
M. LOUISE GREENE, M.Pd., Ph.D. (Yale)

NEW YORK
CHARITIES PUBLICATION
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FOREWORD

"Among School Gardens" is intended, (1) To answer the questions: What are school gardens? What purpose do they serve? Where are the best? (2) To give such explicit directions that a novice may be able to start a school garden; and to show that even the simplest one can be of great benefit to children. (3) To share with those already interested in school gardens knowledge of work done in different places.

Until a few years ago it was difficult to obtain the right sort of instruction in school gardening unless one left home for a long period. Many are unable to do this. General information and some experience in cultivating flowers in a city yard constituted the few foundation stones upon which I decided to build a good superstructure of knowledge applicable to all phases of the subject. The fact that I had to collect my own equipment may enable me to help others who cannot obtain the proper training for school gardening. Some instruction from Mr. Herbert D. Hemenway, one of the pioneers of the movement, considerable practice at the greenhouse bench, in the teacher's class and in charge of children under Mr. Stanley H. Rood, Director of the excellently equipped School of Horticulture, Hartford, Conn., and work with Mr. Henry G. Parsons, lecturer on

the subject in the summer school of New York University, constituted the chief part of my preparation. Visits to some of the best gardens in our own country and Canada were also made. Later, at the suggestion of Miss Mary Marshall Butler, of Yonkers, N. Y., the Russell Sage Foundation asked me to spend a summer studying school gardens with a view to this publication.

I have endeavored to make the book a readable, reliable statement of what seems fundamental in school gardening. It would be impossible to mention the names of the many persons, reaching into the hundreds, who have helped in gathering data. Almost without exception all who were asked gave generously of their interest, knowledge, and illustrative material. Some of the latter was unavailable. What has been used shows special phases of the work and as wide a range as possible of school garden activities. Frequently busy men and women gave from half a day to several days of their time. Without such assistance this book could not have come into existence.

The writer acknowledges with sincere appreciation the courtesies received from the following: Assistant Secretary Hays; Professors L. C. Corbett and Dick J. Crosby, of the United States Department of Agriculture; Miss Susan B. Sipe, Supervisor of Nature Study in the District of Columbia and collaborator in the Department of Agriculture; Miss Louise Klein Miller, Curator of School Gardens, Cleveland, Ohio; Miss Florence

E. Lillie, of Minneapolis, Minn.; Miss Emilie Yunker, Woman's Outdoor Art League of Louisville, Ky.; Miss Stella Nathan, Supervisor of School Gardens for the Board of Education, Philadelphia, Pa.; Mr. John L. Randall, of the Pittsburgh Playground Association; Professor Otis W. Caldwell, of Chicago University, Chicago, Ill., and Professor Benjamin Marshall Davis, of Miami University.

This list, brief as it is, would be incomplete were no mention made of indebtedness to Doctor James W. Robertson and the staff of Macdonald College, Ste. Anne de Bellevue, Quebec; to Professor S. D. McCready, and Mr. E. A. Howes, of Guelph, Ontario.

For the critical reading of the chapter on "Weeds" I am indebted to Professor Alexander W. Evans, of Yale University; of chapters concerning soil, planting, etc., to Mr. R. F. Powell, Superintendent of City Farming, in Buffalo, N. Y.; and for reading the manuscript as a whole, to Mr. Edward Mahoney and Mr. Stanley H. Rood.

To Messrs. Doubleday, Page and Company and The Macmillan Company, to the editors of *Suburban Life*, the National Association of Audubon Societies and the National Cash Register Company of Dayton, Ohio, and to James Vick's Sons, Rochester, New York, acknowledgment is made for the use of excerpts, lists, and photographs.

M. Louise Greene.

New Haven, Connecticut,
March, 1910.

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CHAPTER I

THE EVOLUTION OF THE SCHOOL GARDEN

CHAPTER I

THE EVOLUTION OF THE SCHOOL GARDEN

"School gardens are not intended to create gardeners or farmers, but to afford the growing boy or girl an opportunity for many-sided development."

A SCHOOL garden may be defined as any garden where children are taught to care for flowers, or vegetables, or both, by one who can, while teaching the life history of the plants and of their friends and enemies, instil in the children a love for outdoor work and such knowledge of natural forces and their laws as shall develop character and efficiency.

To make it apparent that size is not a crucial matter, a second definition may be that it "is any garden in which a boy or girl of school age takes an active interest. It may be a tiny seedling growing in a flowerpot indoors or an extensive series of garden crops in a large garden outdoors. The gardens may be collective or individual or both; they may be at the school or the home or both. In all these cases the plants to be grown are much the same and the methods involved in growing them

are similar;"* while the underlying purpose of the teaching is threefold, educational, industrial, and social—or moral, since it is only in relation to others that moral conduct or character exists.

As the founder of the children's school farm in DeWitt Clinton Park, New York, wrote in her first report:

"I did not start a garden simply to grow a few vegetables and flowers. The garden was used as a means to show how willing and anxious children are to work, and to teach them in their work some necessary civic virtues; private care of public property, economy, honesty, application, concentration, self government, civic pride, justice, the dignity of labor, and the love of nature by opening to their minds the little we know of her mysteries, more wonderful than any fairy tale."†

The virtues here enumerated can best be taught in the school garden with the individual plot and ownership, because there the interest is greater, the rewards are more desirable, and cause and effect are more frequently and clearly demonstrable. The cultivation of such virtues is at the minimum when the garden of a school is only a bit of decorative planting in the care of which the children have no part. School-ground decoration of this type is better than none, for like pictures on the schoolroom walls, it sends out a daily influence

* Weed and Emerson: The School Garden Book, p. 3.

† Mrs. Henry Parsons in Report of the First Children's School Farm in New York City, for 1902–1904.

in behalf of orderliness and beauty. So much the more reason why the decorative planting should be of the best, that it may teach symmetry of arrangement, harmony of line and color, and unity throughout.

Such a garden may inspire some degree of



"Mine"

civic pride in the children and some respect for public property through the feeling that their school home is superior to that of others. But these ideas are likely to be limited in practical results to children who have an eye for natural beauty. Introduce but a little bulb planting by the children, however, a little active participa-

tion in the care of the plants and grounds, and at once to each and every child the garden becomes "our" garden, and an injury to it a personal affair; any praise or merit becomes a comment about something "I made or helped to make." With this sense of participation, comes genuine private care of public property. Of necessity, there must follow with this kind of interest, many self-determined convictions on the part of the child as to what is morally as well as culturally right and wrong in the garden. Lessons like these become gradually ingrained modes or habits of thought, and the child fibre is toughened morally.

The larger the field the gardening offers, other things being equal, the greater the opportunity for development of the child. Hence, the plea for individual beds and also for co-operative labor on larger areas, as on paths, and on class or sample plots. The union of these two kinds of tasks best illustrates life where each individual works out his own salvation; if happily and usefully, he must do it with due consideration for others and for his own share of responsibility for the public good.

For the understanding of a subject, it is necessary to know both its past and present. Consequently a brief history of school gardening is in order. Putting aside for a time the consideration of the few gardens,—not more than four or five,—which were started prior to 1900, the movement in America is barely ten years old. Yet, like the occasional stations of the wireless telegraph, it



DOMESTIC SCIENCE OR KITCHEN GARDEN, OAKLAND SCHOOL, CLEVELAND, OHIO

throws a chain of gardens as it were, from the Atlantic to the Pacific, from Florida to Maine; while in our island possessions the people are following our lead, as in Porto Rico, or have antedated our experiment, as in Hawaii.*

In the United States, the initial step in establishing school gardens was taken by the Massachusetts Horticultural Society which, in 1890, sent Mr. Henry Lincoln Clapp to make a study of school gardens in Europe. As a result of his report and the work of the society in encouraging children to grow flowers and vegetables at their homes, interest in school gardening was aroused and slowly but steadily increased. Mr. Clapp himself, Master of the George Putnam school of Roxbury, Massachusetts, instituted, in 1891, the first school garden in America,—a wild-flower garden, for which his pupils brought the earth and collected the ferns. The garden is still in existence with some 150 native wild plants. Since 1900 a vegetable plot with individual beds has been added.

* In Hawaii "The course in the Normal School includes garden and field work, budding, grafting, potting, transplanting, study of domestic and wild animals, beneficial and injurious insects, etc. Plats of ground are assigned to groups of students who supervise the work of the pupils in the training school in caring for these plats. These training school pupils work together by grades, raising vegetables which are disposed of in the city markets. The proceeds are used to purchase school equipment. The other grade schools of the city are also given instruction similar to that in the training school by a traveling instructor, and a portion of each school's grounds is set apart for the growing of vegetables." Alger, E. G.: Circulars of Educational Information No. 13, Dept. of Education, Vermont, 1904.

Mr. Clapp reported that about the beginning of the last century many European proprietors of large landed estates instituted gardens or small farms for the instruction of their younger workmen and for the training of overseers.* Out of this practice grew a few famous colleges, schools of agriculture and farm schools, some of which specialized in one or more branches of garden, field or dairy work. The courses of study were planned to cover three or four years' work, and were offered to children over fourteen years of age who were the sons or daughters of the farmers or laborers on the estates. Governments sometimes became interested in these schools and were even induced to lend them aid.

From such experimental schools there gradually arose the belief that something ought to be done to give children of the rural schools who had reached the age of six some definite instruction in the use of their environment so that they might draw from it both wealth and happiness. The underlying reason for putting such instruction in the schools was not an educational one. The primary object was not to train brain, hands and muscles at the same time, nor to increase brain power through skilful use of the hands and practice in the co-ordination of the little used muscles; it was rather an economic one, to stop the flow of unskilled labor to the towns and cities, to build up the agricultural wealth of the nation.

* See Appendix A, Note 1.

Some of the German states early led the way in the practical demonstration of the value of such instruction. Schleswig-Holstein in 1814, Nassau in 1817, and Prussia in 1819 introduced into the rural schools the culture of fruits and vegetables. Other German states soon followed. Though the point of view was economic rather than educational, the very stress laid upon agricultural results necessitated careful training of the teachers for such garden work and, later, brought the introduction of plant study, even in the cities,* as a special feature of the work of the elementary and secondary schools.

By royal edicts, in 1869, both Austria and Sweden took up the school garden movement. Austria demanded that both a garden and a place for agricultural experiments should be established wherever practicable in connection with rural schools. Sweden required that every school should have a garden containing from 70 to 150 square yards of ground properly laid out.

Belgium has in her elementary schools a compulsory course in horticulture in which she emphasizes the raising of fruit and vegetables and truck farming, the last being the main industry of her people.

* Berlin has a large central garden as well as smaller ones adjacent to her schools. The central garden contains about ten acres. From it, on regular distribution days, there are sent to the schools from 50,000 to 100,000 specimens for biological or botanical study. The daily papers announce beforehand the kinds to be sent. Classes visit the garden to study the growing plants and trees. See Bennett, H. C.: School Gardens in Great Cities, pp. 7–9.

France, since 1880, has recognized the school garden in the curriculum of her elementary schools. By order of the French Ministry of Education, courses in the normal schools are made to include such instruction as will enable graduate teachers "to carry to the elementary schools an exact knowledge of the soil, the means of improving it, methods of cultivation, management of a farm and garden."* The French Ministry states that the main object is "not to teach the business of farming but to inspire a love for the country and to develop the natural tendencies of children to become interested in flowers, birds, etc." This is the law, but in practice the school gardens as late as 1902 were universally maintained more for the benefit of the teachers, many of whom are enthusiastic horticulturists, than for the welfare of the child. It is only since 1902 that gardens have been attached to the rural schools and conducted more and more from the new viewpoint.

Russia, like France, requires every school receiving public funds to maintain a garden for flowers and vegetables and also a plot for orchard and forest trees, and, in addition, an apiary. Short summer courses are provided for teachers. Seeds and books are furnished free, and traveling instructors are sent to see that the gardens are well laid out, properly started, and the courses

*Addis, Wilford: Courses in Agriculture in the Higher Elementary Schools of France. U. S. Bureau of Education. Report of Commissioners for 1889–1890, Vol. II., pp. 1007–1013.

of study well planned. Still, it is the industrial idea that is everywhere prominent.

In England, school garden work has been carried on during the last seventeen years, but until recently chiefly in connection with supplementary schools or maintained by private philanthropy. In 1895, the Department of Education added cottage gardening as an optional study for boys. The gardens were managed by the master of the school or by a gardener from the neighborhood. This method has been improved upon by the present system of supervision. "Each county now has its agricultural inspector. They inspect and often instruct in all the schools throughout their respective counties, lecture evenings and Saturdays to teachers preparing for examination, and carry out a most detailed system of marking day and evening school gardens, and judging flower shows. They plan the gardens and seem to feel that the results should be the best obtainable, even though the workers are children, else the parents will not be in sympathy with the work."* Many of the latter have cottage gardens and are critical judges of the worth of the children's work.

A report in 1908 by Horace J. Wright, inspector

* Sipe, Susan B.: School Gardening and Nature Study in English Rural Schools and in London. U. S. Dept. of Agric., Office of Experiment Stations, Bulletin 204.

The examinations referred to are those of the Royal Horticultural Society covering topics in elementary agriculture. Those who pass successfully are entitled, in some counties, to additional salaries.

for Surrey, gives "in round figures 8300 pupils receiving instruction in gardening at 600 elementary day schools throughout England." These, as well as the "evening school gardens" or "continuation gardens," are steadily increasing. Some counties make liberal grants for the work while others are parsimonious. The evening school gardens were first established in Surrey in 1892, and are intended for boys employed during the day. To such the teacher or gardener of the day school classes gives individual attention twice a week in lessons of at least an hour. The school garden plot is usually one rod square. "There must be a teacher for at least every fourteen boys." The pupils must be eleven years of age or older. Prizes are given to both the boys and the teacher. Indeed, the teachers' salaries are determined somewhat by the total number of marks given to each garden and its relation to the county's average as determined by the county inspector. Salaries for a garden are based upon a fee of three shillings a pupil for each plot cultivated throughout the summer, with the addition of merit grants according to the rating of the garden. Sometimes the teacher having the best garden in the county, "the county premier," is awarded a medal or silver watch.

In Switzerland almost alone we find emphasis placed upon the pedagogic and the utilitarian value of the school garden. For some years, the Swiss have kept both ends equally in view.

In the middle grade of the primary schools, pupils acquire some knowledge of agriculture. Instruction is given in soils and their fertilization and in practical field work. Such instruction, like the nature work in our own schools, is a part of the regular curriculum. Its aim is pedagogical. The utilitarian information given is incidental, though, of course, it appears otherwise to the child and often to the child's parents. The main object of the study is to train to better mental grasp by developing the power of observation, the skilful use of the finer muscles of the hands, and by experience through practical lessons in cause and effect.

Turning for a moment to Canada, where, in the spring of 1904, a group of school gardens was established in each of the provinces of Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward's Island, we encounter the work of Dr. James W. Robertson,* former Commissioner of Agriculture and Dairying and until lately director of the Macdonald Fund and President of Macdonald College at Ste. Anne de Bellevue. The Macdonald Fund for the establishment of the Macdonald schools throughout the eastern provinces, Macdonald Institute at Guelph, Canada, neighbor to the Ontario Agricultural College, and Macdonald College recently established at Ste. Anne de Bellevue in the province of Quebec, were

* Dr. Robertson is known as the "Agricultural Wizard of the North."

the gifts of Sir William C. Macdonald of Montreal.

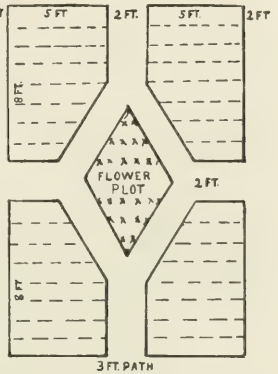
The Macdonald movement "aims at helping the rural population to understand better what education is and what it aims at for them and their children." It deals on the one side with the improvement of homes through its preparation of



Macdonald College, Ste. Anne de Bellevue. School Garden on the "Group Plan"

teachers in domestic science and household art, and on the other with the betterment of rural home conditions through improvement of the school life and modification of the curriculum to meet the needs of rural districts. As a vital factor bearing upon the life of the community, and as pedagogically sound, it introduced in addi-

tion to manual training, the school garden, whose influence and worth had already been demonstrated at Toronto in the Broadview Gardens attached to the Boys' Brigade Institute,* and on a larger scale by Dr. MacKay, superintendent of education in the Nova Scotia schools. As early as 1904, Nova Scotia had some 79 gardens, and the maritime provinces have sent the greater number of teachers to Macdonald Institute for the spring and summer courses.



SECTION OF A "GROUP" GARDEN: ONE OR TWO CHILDREN ON EACH VEGETABLE PLOT

The Macdonald school gardens put in the background European ideas of utility, whether economic or as preliminary to a scientific study of agriculture. Insisting that "nearly all such

* This Institute, under Captain Atkinson, is a self-governing club, carrying on evening classes; two joint stock corporations (one dealing in honey, one in maple syrup); and a garden on a township plan of control. The boys pay for their garden privilege. They make what they can from their produce, even being allowed to speculate by hiring some of their fellow farmers to work for them or by buying standing crops. This practice is guarded somewhat, and is defended on the ground that "such is life," where foresight, brains, industry, rightly count more than short-sighted contentment with being just a "hewer of wood" or unskilled tiller of land. Plots near the street are sold only to good gardeners. In 1908 one boy took $18 in prize money alone.

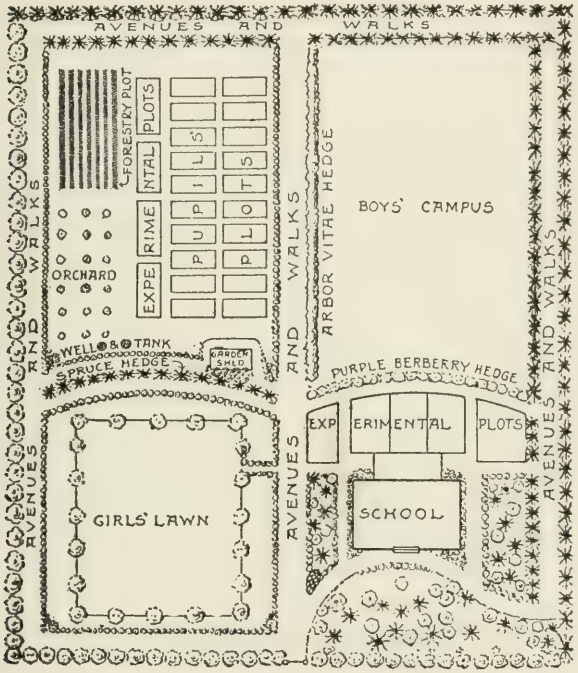
gardens stop short with a certain amount of scientific information and the habit of careful observation," these Canadian gardens while "designed to encourage the cultivation of the soil as an ideal life work, intend to promote above all things else symmetrical education of the individual." Hence, in order that this attitude might



MACDONALD INSTITUTE, GUELPH, SCHOOL GARDENS, JULY, 1909

be emphasized and the gardens become a factor in an educational movement, Dr. Robertson brought them under the Department of Education in each province rather than under the Department of Agriculture. Twenty-one school gardens were started and were maintained free of cost to either pupils or the public for three years. The various provinces passed Orders in Council incorporating

them into their educational systems, thus placing the school gardens of Canada on a broader educational basis than those of any other state or country.



Bowesville School Grounds, Canada

"The Macdonald school gardens not only have a recognized place in the provincial systems of education, but they are attached to the ordinary rural schools, owned by the school corporation,

and conducted under the authority of the school trustees and with the express approval of the rate payers. The work of the garden is recognized as a legitimate part of the school program and it is already interwoven with a considerable part of the other studies. The garden is becoming the outer classroom of the school, and its plots are its blackboards. The garden is not an innovation, or an excrescence, or an addendum, or a diversion. It is a happy field of expression, an organic part of the school in which the boys and girls work among growing things and grow themselves in body and mind and spiritual outlook."*

At the beginning of the movement, six teachers of experience in the rural schools were selected and sent, at the expense of the Macdonald fund, for special studies to the Ontario Agricultural College at Guelph and to Chicago, Cornell, Columbia and Clark universities. They were specially trained to supervise the work in each of the provinces.† The general plan was to have the gardens started in groups of five schools each, at distances of from seven to fifteen or more miles apart, and to have traveling instructors superin-

* Cowley, R. H.: The Macdonald School Gardens of Canada, *Queen's Quarterly*, p. 401.

† For the present requirements for teachers see Elementary Agriculture and Horticulture and School Gardens in Village and Rural Schools. Explanatory and Descriptive Circular No. 13, Sept. 1907, July, 1909, issued by Department of Education, Toronto, Canada. Also programs of Summer School for Teachers, issued by Macdonald Institute, Guelph. See Appendix A, Note 2.

tend the work of each group. By these means the value of the work became known to as many taxpayers as possible. To further this end, the gardens were open to inspection at all times and their pupils encouraged to try for prizes at the county fairs. "In many places the people have taken up the experiment with an openmindedness



Teachers' Class Visiting the Merden School Gardens, Canada

that has already carried it far on the way to success." Today, with the exception of Quebec, where a dual system of schools (Protestant and Catholic) exists, the Macdonald school gardens, some twenty-nine in number, are supported largely by the provinces. In Quebec and in a few instances elsewhere the Macdonald fund still offers assistance, though its chief work is to

support the two institutions for the suitable preparation of leaders and teachers in the "new education."

Among pioneer school gardens in the United States, one of the earliest, largest and most complete was that established in 1897 by the National Cash Register Company of Dayton, Ohio. The president of the company, after an investigation of the successes and failures of the men who had been boys with him, was impressed by the fact that there had been scarcely a failure among those boys who had been responsible for some farm or garden "chores." He decided that in a very rough neighborhood he would make the experiment of using the surplus energy of the boys in practical garden work and let them have the products of their steady work and business energy. So gratifying was the result that the garden is today a marked feature of the welfare work for the employes of the National Cash Register Company.*

About the same time, 1897–1898, several normal schools in the east began to offer instruction in school gardening, notably Hyannis, Massachusetts, where, by means of the gardening lessons, banking and business operations were taught, as well as the correlation of garden work with arithmetic and

* The plots are 10 x 100 feet. They are for boys old and strong enough to garden on a scale sufficient, for example, to permit one boy to provide a family of five with fresh vegetables throughout the season, and make $5.00 in addition. The boys work under a competent gardener.



"BOYS SHOULD BE FORMED NOT REFORMED." (National Cash Register Gardens)

other studies of the schoolroom. South Framingham, Massachusetts; Willimantic, Connecticut; Hampton, Virginia;* Johnson, Vermont, soon fell into line. In the west, the development of the garden in connection with rural and consolidated schools, was taken up with energy.† Salt Lake City, Utah; Silver Lake, New Mexico; Joliet, Illinois; Louisville, Kentucky; St. Louis, Missouri; Menomonie, Wisconsin; and Los Angeles, California, were among the pioneers.‡ The Normal School of Washington, D. C., introduced the work, and Congress finally made a small grant for gardens in the District of Columbia. By 1904, Circular 13, issued by the Department of Education of the state of Vermont, reported in all from fifteen to twenty normal schools and ten or twelve agricultural colleges throughout the country as displaying much interest and activity in the school

* The Whittier School is the practice school of the Institute. It is also a free public school. Probably no school garden in the country has had a greater influence than that of the Whittier School. It reaches about 300 of its own children and through the work of the normal department of Hampton, hundreds of teachers and thousands of children of the colored and Indian races.

† Supt. O. J. Kern's work in Winnebago County, Ill., is especially noteworthy. See Annual Reports of the Winnebago County Schools and also his Among Country Schools, Ginn and Co., Boston, 1906.

‡ This chapter confines itself to a brief mention of those cities or gardens where pioneer work was done and to an outline of its development up to the present time when there are too many towns and cities engaged in the work to enumerate them. Later in the book special references are made to some of the striking details in the work of different localities.

garden movement. Preparation was thus being made for putting school garden instruction on a pedagogical basis and preparing teachers for their work.

Since 1904, other institutions, such as New York University, Amherst Agricultural College, Storrs, the Chautauqua Assembly, have opened



MORGAN SCHOOL, WASHINGTON, D. C.

short summer courses for teachers, and in 1909 the University of Pennsylvania gave a course of four lectures, offering as an object lesson to its summer students a school garden cultivated by the children of Philadelphia.* Both lectures and

* Already farmers' institutes of several states have officially endorsed the school garden; summer schools are offering courses for its advancement. The agricultural colleges of Indiana, Illinois, Iowa, Minnesota, Ohio, Nebraska, Rhode Island, Tennessee, Wisconsin, and

garden were conducted by the city supervisor of school gardens. Cornell in her Agricultural College offers helpful courses, and constantly seeks to arouse and sustain interest in the outdoor world and particularly in rural life, by means of her many bulletins. The Rural School Leaflets and Home Nature Study Course are widely distributed.

In the central west, the Cleveland Home Gardening Association began its work in 1900 with the distribution of 48,868 penny packets of seeds. In the following year, it instituted a test garden in the center of the city. It has continued and greatly increased its work both with adults and with the school children under the direction of the able curator of school gardens, Miss Louise Klein Miller. The Cleveland board of education was the first to appreciate the value of school garden work and to create the office of curator. The curator is not on the educational staff but holds office under the administrative department and is responsible to the director of schools. The board places at the curator's disposal three laborers and in 1909 gave her an assistant teacher. While laying much stress on the nine school gardens connected with its schools and steadily enlarging their number, it particularly emphasizes school-

others among the states are doing what they can in the way of training teachers. In 1909 the Rhode Island College provided a traveling supervisor for the gardens already established in Providence and Newport. Normal schools and colleges are also providing winter courses, giving the teachers either Saturday lectures or more extended courses through a part of the year's session.

ground decoration. The board encourages but does not enforce correlation of school garden work with routine studies.* It does not, in any grade, compel the children to work in the gardens. However, it conducts gardens throughout the year, and provides for informal instruction by the curator, for lectures on gardening in the schools in the spring, and for flower shows in September and October. Co-operating with the Home Gardening Association of Cleveland, the board approves the association's vacant lot work and its training garden, where boy farmers are taught simple truck farming.† Together, they encourage the children to purchase bulbs and seeds, to plant home gardens, and to take an interest in the flower shows and festivals at which prizes are offered by the association or its friends. In school ground decoration the children usually have some part, either in the planting, or care or both. Today, Cleveland has more than 50,000 home gardens due to the influence of the school garden and the efforts of the Home Gardening Association. The latter distributes seed packets and bulbs by the hundred thousands both in Cleveland and in outside territory.‡

* The curator has worked out a system of correlation in arithmetic, geography, drawing and manual training which is optional.

† Plots in the training ground are 14 x 25 feet and 28 x 50 feet, in all about 65 plots, and are for boys from ten to fourteen years of age.

‡ Outside of Cleveland in 1909, 421,611 seed packets were distributed.

The Home Gardening Association.

SEEDS FOR 1908.

Price One Cent a Packet.

Mark opposite the variety the number of packets wanted. Separate Colors Cannot be Ordered.

FLOWER SEEDS.

Aster, mixed, Scarlet, White and Rose. 15 inches high.	**Morning Glory,** a climber, mixed colors, 12 ft. high.
Bachelor's Button or Cornflower, mixed, Blue, Pink and White, 2 ft. high.	**Nasturtium,** a climber, mixed Yellow, Orange and Red, 6 ft. high.
China Pinks, mixed, Pink, Scarlet, White, and Lilac, 6 inches high.	**Petunia,** Purple and White, 1 ft. high.
Calendula, Yellow and Orange, 1 ft. high.	**Phlox,** mixed (annual), Scarlet, Pink and White, 1 ft. high.
Candytuft—mixed, White, Pink and Red. 1 ft. high.	**Portulaca,** mixed colors, 4 inches high.
Four-O'clock, Yellow, White and Crimson, 2 ft. high.	**Scabiosa,** or Pincushion, mixed, Red, Lilac and Pink, 1½ ft. high.
Larkspur, Blue, White and Pink. 2 ft. high.	**Verbena,** mixed, White, Scarlet, Purple, 6 inches high.
Marigold, French, Yellow and Brown, 1 ft. high.	**Zinnia,** double, Scarlet, 2 ft. high.

VEGETABLE SEEDS.

Beans, bush, 1 ft. high, Plant about May 1st.	**Onions,** 1 ft. high. Plant about April 15th.
Beets, 9 inches high, Plant about April 25th.	**Radishes,** 6 inches high, Plant about April 15th.
Carrots, 6 inches high, Plant about May 15th.	**Spinach,** 6 inches high, Plant about April 15th.
Lettuce, 9 inches high. Plant about April 15th.	**Sweet Corn,** 6 ft. high. Plant about May 15th.

Return this envelope to the teacher, with your money. Do not put money in this envelope.

No. of packets..... Amount..... cents.

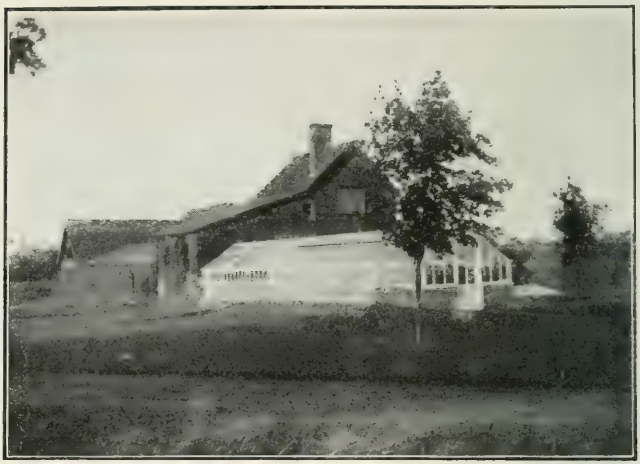
Write your name here.....

Address .....

School..... Grade..... No. of Room.....

Your seeds will be delivered in this ENVELOPE about April 15th. Prepare your garden early in April. Select the sunniest part of your yard, but avoid a place where the drippings from the roof will fall on the bed. Dig deep—a full foot—and break up the lumps. Soil with well-rotted manure dug in will give better results than poor soil. Vegetables require good, rich soil.

In New England the pioneer work of establishing school gardens was, as has been said, begun under the influence of the Massachusetts Horticultural Society; and a little later the Massachusetts Civic League, the Woman's Auxiliary of the American Park and Outdoor Art Association, the Twentieth Century Club and the Normal



School of Horticulture, Hartford, Conn.

School of Boston as well as other clubs, schools and village improvement societies throughout the state, took up the work.

In Connecticut, the Rev. Dr. Francis Goodwin in 1900 founded the Hartford School of Horticulture. The enterprise of the Women's Civic Club of that city, shortly after, started a garden

in the public park, which has now been taken over by the board of school visitors as one of the several gardens maintained by them. Dr. Goodwin founded the School of Horticulture to give opportunity for individual work and graded training to the boys of the Watkinson Farm School of which he was a trustee. Under Mr. Herbert Hemenway the work of the School of Horticulture was broadened to include city boys and girls, teachers' classes, and gardens for adult men and women who wished to cultivate a plot under expert supervision or advice. Recently, under the present director, Mr. Stanley H. Rood, lecture courses have also



Boys' Plots, School of Horticulture



A Teacher's Garden, School of Horticulture

been given to teachers by experts upon such practical problems as soils and their treatment, and other agricultural topics.

Another pioneer garden serving as a model for the peculiar needs of congested districts in large cities, is that of DeWitt Clinton Park School Farm of New York, originated and started in 1901



DeWitt Clinton Park School Garden, New York City

by Mrs. Henry Parsons. It has given inspiration to many people to start other gardens upon similar lines. Its work was exhibited on a small scale at both the St. Louis and Jamestown Expositions. On little 4 x 8 foot plots by a system of two plantings, one in May and one in July, it takes some thousand children off the city streets, furnishes nature study material to schools and vis-



SECOND PLANTING, WAINWRIGHT GARDEN, PHILADELPHIA

iting classes, and gives to a number of crippled children brought there each week, some happy hours working over their little farms, or superintending such work when it must be done by stronger arms. The School Farm, with its flowers, its regular lines of vegetables, its grains and observation plots, presents an almost park-like appearance to the neighborhood.

The earlier work of Philadelphia with its constantly increasing number of school gardens, the work in Washington, D. C., and the successful Fairview Garden School of Yonkers, New York, should be mentioned among the pioneers.

Philadelphia stands out today as the city whose board of education most fully recognizes, from the pedagogical and educational standpoint, the value of the school garden. It appoints a supervisor of school gardens (Miss Stella Nathan); incorporates the work into its school system in certain grades, and maintains the gardens throughout the growing season. The teaching in the gardens, therefore, follows a prescribed course, yet loses none of its joyous, vital interest to the children. This instruction is correlated in the school room work "from the kindergarten to the senior class of the normal school." Philadelphia now has 8 school gardens, accommodating from 150 to 200 children each, 22 kindergarten and 1764 home gardens. It is intended in the coming year that these last shall be regularly supervised by one of the staff of gardening instructors in the

neighborhood where they are located. The details of this work as well as that of Cleveland will be taken up later. These two cities are foremost in demonstrating the value of the school garden and in honoring it by placing their respective curator and supervisor in high official positions, with suitable appropriations for their work.

In the United States school gardens are spreading rapidly, and the work is becoming more and more recognized as worthy of a place in local educational systems. At the national capital, the District of Columbia, limited by the terms of the Congressional appropriation of $1200 for school gardens, which forbid the use of the money for salaries, does the next best thing and appoints Miss Susan B. Sipe, one of the teachers in the Normal School, at a nominal salary, as supervisor of nature study and school gardens in the District of Columbia. A course in nature study has been prepared defining the work from grade to grade and so systematized that each child has a "required amount of work in the school garden just as he has in arithmetic, reading, etc." Washington has four large school gardens on vacant lots, and for school-ground decoration Miss Sipe counts 100 white and 50 colored schools in all but 3 of which the children have some part in the planting and care. Moreover, as emphasizing the value of her work, the United States Department of Agriculture has made her a collaborator in the Bureau of Plant Industry and fur-

nished her with a greenhouse for the instruction of normal students in school garden teaching. These pupils are required to conduct home gardens under supervision. The Bureau of Plant Industry, together with the Office of Experiment Stations, works with the schools, furnish-



Corner of Ludlow Schoolyard, Washington, D. C.

ing the supervisor with plants, seeds and other material.

Nor does the United States government stop here in its furtherance of the movement. It has published a large number of bulletins on school gardens and allied topics which may be had by application to the Secretary of Agriculture. The

Bureau of Plant Industry furnishes a large amount of seeds in answer to "school requests," which latter have steadily increased in number since 1904, and now come from every state in the Union, mounting into the thousands.* These seeds are put up in four sets; namely, flowers, vegetables, decorative and economic. Each of the first two sets contains five packets of different kinds of seed. The decorative set contains ten and the economic eighteen packets, with enough of each kind to plant a square rod of ground. Three of the most important Farmers' Bulletins are No. 195, Annual Flowering Plants; No. 218, The School Garden; and No. 134, Tree Planting on Rural School Grounds. One of great interest, No. 204, Gardening and Nature Study in English Schools, Office of Experiment Stations, has been referred to.

The school requests indicate a widespread interest in garden work for children. As yet one may readily count the number of gardens that have risen into prominence because of their exceptionally fine work. There are, however, with and

* In 1908, 1400 requests for seeds came from approximately 4200 schools and ranged from one order of each set of flower and vegetable seeds to sometimes as many as 300 of these, and usually included decorative and economic sets. The economic set includes grasses, cereals, forage and fibre plants so that the children may become familiar with staple crops grown elsewhere than in their own locality. There was enough of each kind of seed to plant a square rod of ground. Requests for from 50 to 100 sets were not uncommon.

without government help, hundreds of school gardens cultivated by from 20 to 200 children each, in scattered towns and cities from Maine to Virginia, and from the Mississippi to the Atlantic, that are quietly doing good work the excellence of which in many cases has not come to public notice. In the south and middle west and in the far coast



SECOND GRADE CHILDREN MAKING CUTTINGS. NORMAL SCHOOL, WASHINGTON, D. C.

states, in territory with which the writer is not personally familiar, there are thousands of tentative attempts to utilize this new factor in education.

As a rule, the normal schools have been the first to endorse the school garden and to try out its value, while boards of education have viewed

it as a new thing requiring it to prove its educational and social worth. Frequently they give it a meagre support, recognizing it perhaps by the appointment of a nature study teacher as a supervisor of school gardens, but granting little or no money toward either the maintenance of the garden or a reasonable salary to cover the summer's work of supervision. Sometimes this lack of support is due to a division of opinion among the school commissioners or among members of the boards of estimate. It may meet the opposition of the older and more conservative principals of the city, or of a ward politician who sees no sense in it and is afraid that the voters will look upon it as a new fad or a new excuse for increasing taxes.

Generally, the school garden idea has captured the educational leaders in our country, made friends for itself among the most progressive of our teachers, old and new, and won the children wherever it has been tried. One drawback to its rapid growth is that there is still confusion because of the stress that has been laid sometimes upon theoretical views; or upon its peculiar fitness to meet the special needs of particular places. These lesser questions can be safely left to settle themselves, for a school garden is like a bank in that it may be drawn upon for values of different kinds to meet different needs, as one may require money in the form of gold or silver, check or draft. In a school garden the educational, economic, æsthetic, utilitarian, or sociological value may be

made most prominent, according to circumstances. Its power for developing a child's nature should not be confined to only one of these viewpoints; neither should it be considered appropriate to one stratum of society or to a few classes of children only. It may ease the condition of the poor and bring profit and pleasure to their children. To the children of the rich and well to do it will give pleasure, and should teach some needed lessons in



MACDONALD CONSOLIDATED SCHOOL AND GARDENS, GUELPH

personal responsibility and in the consequences of broken laws from which it is human nature to think that one may escape.

So long as the educational value of school gardens is not fully recognized by local school boards, just so long will they be dependent for their support upon philanthropic societies or upon the good will of private individuals, and be subject to the discouragement of loose tenure and shift of locality as land values rise. Until very recently

those interested in agriculture or horticulture or in attempts to benefit social conditions have been most active in establishing them.* It is interesting to note how many gardens like those at Yonkers, at Pittsburgh, at Dubuque and, in part, at Cleveland, have developed into social centers. Among educators, friends of the school garden are multiplying rapidly, and increasing numbers believe "that instruction such as is given in the school garden is of the right kind. It arouses interest in real things; it develops judgment; it brings the child in contact with his environment, and above all, it gives that opportunity for placing responsibility on the child without which character is not developed. The activities of school garden work are natural to the child and give much needed respite from school-room restraint. . . . The child's mind gets growth out of them because it can understand them. Not only does the school garden serve to educate and train, but it supplies a kind of knowledge

* The National Plant, Flower and Fruit Guild encourages school gardens and through its local branches assists in starting them.

The International School Farm League seeks to develop the school garden in connection with schools, parks, institutions and day camps, as an educational, recreational, sociological, and remedial agency.

The Gardening Association of America, organized October, 1909, in Buffalo, gives equal emphasis to vacant lot and school gardening and will encourage both because of their tendency to benefit the poor, to show the power of self-help, to further agricultural interests, to lessen the evil influences of city life and to cultivate a love of growing plants.



A PHILADELPHIA SCHOOL GARDEN

that is highly useful and cultivates a taste for an honorable and remunerative vocation."*

Perhaps best of all is that teaching of the saner and sweeter side of life which comes when the school garden takes the child off the city streets, away from crowded alleys, vicious surroundings, and, in the country, often from misspent leisure; when it finds happy work for idle hands, health for enfeebled bodies, and training for the will and affections. If you doubt the last service, watch the child's love for the flowers and vegetables he has made to grow, and the affectionate pride of his parents in the success of his garden. Sometimes a selfish interest in what the child can provide for the family table has brought him more consideration and developed greater gentleness and cooperation in the family life. It has proved just as well to "stand in" with the little farmer who can provide otherwise unattainable delicacies of fresh vegetables, salads and soup materials.

All these things make any kind of a garden worth while, and, if we utilize the interest in it to freshen the wearisome tasks of the schoolroom, there is an added value. The dullest child will brighten as he or she lays out the little plot, figures out the crops, or calculates the gains. The telling of a story with innocent and pleasurable self interest as the pivotal point, opens a way into an easier and better land of composition than was dreamed of before; while history and geog-

*Spillman, W. J.: Significance of the School Garden Movement

raphy, textiles, food and clothing have surprising relations to a garden which an occasional apt reference or illustration can bring out. More and more it is being made the partner of physical geography. In every school it should be the twin of nature study and usually the companion of manual training. It is easy to show how much we owe to the husbandman; how the life of the whole round world is inter-dependent, or in a child's phraseology, "hangs together"; how tilling of the soil is a fundamental necessity. No child who has ever loved a garden will despise the farmer, for he has learned by experience to respect manual labor; and that brains and hands must work together to bring good crops.

CHAPTER II

DIFFERENT KINDS OF SCHOOL GARDENS

CHAPTER II

DIFFERENT KINDS OF SCHOOL GARDENS

"Why should you give your pupils the benefit of a school garden? Because it brings living principles home to the children, and school is *living*—not a preparation for life. Because it enables the children to solve for themselves, under the law of necessity, some of the most difficult problems which the school course has to offer. . . Because the garden supplies ideal conditions for cultivating the hand and the heart as well as the head."—S. T. Palmer.

"In town schools the best plan is to begin with the school garden and emphasize the æsthetic side; then work out to beautify the city, and on this basis work out to the great typical processes of agriculture. In rural schools, the most successful agricultural instruction is that which begins with the agricultural activities of the local environment, and which finds in these activities certain problems which then become subjects of investigation, and even experiment in a school garden."—B. M. Davis.

SCHOOL gardens may be regarded from several points of view and cultivated with one or more of several aims in mind so far as the immediate or future good of the child is concerned. But whatever the special purpose, there should be kept in mind the far reaching influences that will pervade a neighborhood when a successful school garden so inspires the children and parents that little gardens in home yard or window box spring up as restful, cheerful bits of

color. These are a bond of sympathy and pleasure among the poor, the well to do and the wealthy. There is no hobby that may be so inexpensive; no subject of conversation less likely to become disagreeably personal; no topic offering better opportunities of give and take in the matter of experience



Could You Do Better?

than that of flowers. So it follows that a love of flowers tends to level class distinctions; to give openings for real friendliness based upon mutual interests among people whose business and environment may be vastly different. Moreover, the individual betterment that comes from any worthy hobby follows in the wake of flower culture.

Considering school gardens from the point of view of maintenance, including organization and purpose, they may be divided into four classes: (1) those maintained by individuals, corporations, clubs, philanthropic organizations, playground associations, civic clubs and village improvement societies; (2) gardens supported by and under the control of park commissioners or city recreation bureaus* or boards of public works; (3) those maintained by school commissioners, trustees, or boards of education, in connection with schools, whether as experiments, as features of vacation schools, or as accepted and valuable parts of the school system for which distinct appropriation is made. A fourth class might include many existing gardens where the experiment is maintained by a combination of any two of the above named agencies, as when land is furnished by school board or park commissioners, and means for equipment are supplied by club or private subscription.

In the matter of organization, park or school boards usually appoint the head and assistant teachers of gardens under municipal control. Where a club supports a garden, a committee of ways and means is chosen to select the head teacher, to whom is turned over the entire responsibility of running the garden. In either case, reasonable consideration should be shown

*St. Louis Park Department Public Recreation Commission supports its children's gardens.

the head-worker in the garden, and deference paid to her knowledge of the most desirable type of assistant (training and personality considered) that the particular garden requires.

One city selects assistants from such of its regular elementary grade teachers as are enrolled upon the eligible list. It employs them in groups of two or more to serve in the gardens either in the afternoon or forenoon for five days each week from July to September and pays them $12 per week. The gardens are also open for work after school hours and on Saturdays in June and September. No insect study or other allied work with garden material is required; the lessons are confined to elementary gardening. The teachers must have had at least one season under experienced supervision in growing the crops that the children will raise. These gardens have a floral border filled by the overflow from the city's park supply but with room enough left for the children to grow a few plants as their contribution to the beauty of the whole. The individual plots or farms stand for individual care and rights, —even to the right of carelessness as an instructive example. The border demands of the little citizen his or her share of responsibility for the community's standard of order, beauty and co-operation.

In cities where there are a large number of gardens, often of various types, an inspector, supervisor or curator of gardens is appointed, with assistants in each garden to carry out plans

and instructions. Such assistants may be grade or special teachers, janitors, gardeners, or even some of the more capable children who are selected to have an oversight over their mates and feel highly honored by the titles of section leader, tool keeper, head gardener, monitor, or even constable, and are held responsible for the orderly behavior as well as for the work of their charges. The following report gives an illustration of active co-operation by the children in the supervision of the garden work.

Secretary's Report

Minneapolis, Minn.
April 20, 1909

To the Honorable Members of B Room:
Pierce School.

I have the honor to transmit the following report.

The B Room held its first business meeting on tuesday April 20, 1909 at 9: a. m. Our principal, Mrs. Mary D. La Rue presided over the meeting, and the following officers were elected by ballots.

Henry Johnson was elected superintendent of the garden. To assist him, the following eight section superintendents were chosen; Blanche Uptergrove, Lewin Olsen, Clarence Hansen, Mary Falconer, Bennie Anderson, Henry Johnson, Helmer Hammer, William Uptergrove and Abner Anderson. Ruth McDonald was elected Treasurer. Mildred Formoe was elected Secretary. Special work was given to each officer, who has the power to [choose] the helpers that he may need.

Respectfully Submitted
Mildred Formoe
Secretary

Age 12 years. B 6 Pierce

In very many cases, the assistants are regular teachers who volunteer during the spring term for the extra hours of work in their desire to hasten the day when the school garden shall become an established feature of their school. Where a garden is part of a school a principal will often supervise the work and arrange that each grade teacher shall have time to take her children to the garden for an hour or so in the course of each week; while, if the garden is carried through the summer, a school teacher (sometimes the principal) is hired for the vacation period. Sometimes the garden may be cared for during the summer by the janitor or by a committee of the children who remain in town.

Turning to the kinds of gardens considered according to environment and purpose, and following the analogy of flowers, they may be divided into two orders with several varieties in each; namely, (I) The urban or city school garden, answering to the needs of towns and cities, and (II) the suburban or rural, answering to the needs of small villages and country districts, the two classes being subdivided according to the particular object in mind in the laying out of each. For instance, gardens aiming especially at school-ground decoration would occur in both main divisions in connection with both city and rural schools. And again, gardens for experimental purposes, designed to make clear the use of fertilizers, the development or deterioration of

crops, and like work, would have a place under rural school gardens and also, to some extent, in almost any well-conducted city garden. The growing of vegetables or flowers or of both as the child's very own property would enter into nearly all varieties of gardens; consequently, this simplest and most frequent form of school gardening may be taken as a "fundamental type," just as there is at the other end of the scale the rarely attained and, at first, seemingly costly ideal, a "model school garden." The latter is not costly, however, if measured by effectiveness of results, and the education that can be accomplished through it.

The ideal school garden includes the formal or ornamental garden that should be the setting of every model school building; large and separate playgrounds for boys and girls, with screened and vine-covered outbuildings, where necessary; a large garden, having individual and co-operative flower and vegetable plots, also some for observation or experiment ("sample plots," they are frequently called), and larger areas for forestry, grapery, nursery and the growing of small fruits. There should be hot and cold frames for forcing, and a small greenhouse. Most important of all, there should be a controllable water supply and, if possible, a basin or pond for aquatic life. An equipment of tools and a toolhouse are necessary, and an arbor should be provided which may also be used as an outdoor lecture room or for shelter

from sudden showers. Sun dial, weather vane and rain gauge, together with barometer and thermometer for daily observations should be at hand. To be complete, the model garden should have a suitable place for storing fertilizers, seeds and garden requisites, and even a small suite of household rooms with lecture room and laboratory for carrying on the home laboratory



Housekeeping Room, DeWitt Clinton Park, New York City

and lecture work for which the garden furnishes both material and opportunity.*

This may be ideal and rarely attainable at the start. It is often better to work up to this com-

* DeWitt Clinton Park School Farm Garden has such a suite of rooms, including those for tools and for laboratory work, in the basement of the pergola that bounds the garden on the Hudson River side. In these, elementary lessons in housewifery as well as in agriculture are conducted.

plete garden; to have it built up gradually by the children and their interested associates and older friends. Yet in cities where there is a system of gardens it is well to have one such as a model of attainment.

At the present time there are, as has been said, school gardens of many varying kinds carried on for different immediate ends though with the one underlying and universal purpose of helping the children to an all round development. Some of these gardens will be briefly sketched. It is probably true that the mental picture which the term "school garden" most frequently calls up is that of a plot of ground laid out in small individual beds where the common vegetables, together with one or two varieties of flowers, are grown; and larger areas for flowers and observation, or sample plots, on which are grown various plants including the common troublesome garden weeds. In such a garden the children may learn the joy of individual ownership and of co-operative or group work as well. They will at the same time, through sharing in the work on the larger plots, become familiar with a wider range of plant life than that which could be grown on their own small plots. Such a mental picture may have for its setting the congested quarter of a great city, a bit of a public park or playground, a part of town or village schoolyard, or it may be an isolated vacant lot transformed.

To know how to plan, to care for and conduct

such a garden requires the fundamental knowledge necessary to success in carrying on any kind of a school garden. For this reason, and because it is more likely to be the sort of garden attempted in any locality as an initial experiment, it is here taken as the basic type, and to it and the work



"Little Brother Helps"

that may be centered in it, the greater number of the following chapters are devoted. One may find such gardens in the east and south, in our middle and western states, in Canada and in the West Indies, though in the last the nature of the crops will vary considerably from the uniformity common on the continent. Its plots may be tiny or big, its

equipment small or large, the scope of its work narrow or wide, its quality and quantity graded or ungraded; but as far as it goes, its teaching and experience are fundamental, whether for teacher or child. So to this "fundamental type" we give *par excellence* the name "school garden," because in the mind of psychologist, educator and teacher, it is a school in which to cultivate, to develop children quite as much as or more than to teach them how to grow flowers or to mature vegetables.

This fundamental type offers the largest cultural development for children in the smallest area. It demands of the teacher either little or much training, according to the scope of work carried on in it. Nowhere is less previous experience required except in the tiny posy garden or where, as in some formal gardens, the work of teacher and children is confined to a very small amount of supervised planting, whether of bulbs or seeds, and to the necessary later care in watering and in keeping the soil loose. From the likeness of much of the work in the "fundamental type" to truck gardening, and from the children's delight in being known as little farmers owning their small farms, this basic type might be called not only the "school garden," but the "school garden farm."*

* This term would be equally applicable to the usual school garden in cities and to the extensive school garden tract of five acres or more which Minnesota requires under the Putnam Bill, or to such gardens of lesser area, as would be advisable in our agricultural states. The difference in size would be suggested by the locality mentioned or by the context in which the term occurred.

School gardens might then be divided into

I. Urban or City Gardens, including
   1. The school garden farm (the one usually adopted for congested districts).
   2. The garden for school-ground decoration.
   3. Gardens for special purposes; such as
      a. The domestic science or kitchen garden.
      b. Gardens for germination or forcing purposes.
      c. Gardens for nursery or forestry purposes.
      d. Botanical gardens laid out from the standpoint of
         (1) Plant families.
         (2) Commercial or home economics.
      e. Exchange gardens as clearing houses for surplus plants.
      f. Training gardens or those of considerable size where stress is particularly laid on large individual plots and the training of their owners to truck farming, even on a commercial scale.
      g. Gardens for defective or delinquent children.
      h. Gardens for other specialized aims, whatever they may be; as, for example, for growing material to illustrate special subjects, or for children in the kindergarten, etc.

II. Suburban or Rural Gardens.
   1. The school garden farm.
   2. Gardens for school-ground decoration.

3. Trial gardens or gardens for experimental work with plants or crops. (These are often coupled with No. 1.)
4. "Topographical" or chart gardens, leading directly to a wild flower garden or to schoolground decoration or to the school garden farm.

The classification into "group" and "individual" gardens is not given here because by far the greater number of gardens in some measure combine the two, and because the term is a distinction in method of work rather than in character of gardens.

It is a far cry from the complete outfit of the ideal garden to taking up the pavement in a school yard and making 2 x 2 foot beds for tiny farms. But, as one cannot expect completeness, so one may hope to avoid such impoverishment as the 2 x 2 foot plots would imply. If you cannot do any better, begin with the 2 x 2 foot bed and comfort yourself with the thought of the lesser sum of money needed and the probability that the question of soil will resolve itself into buying a few bushels or at most a few loads of good garden soil, such as would be necessary in the case of a roof garden.* In cities, parts, so to speak, of the ideal garden may be scattered judiciously among the various schools, in their yards or on nearby vacant lots. For instance, one school may have only the garden

* A load of earth or gravel is one cubic yard, estimated at 150 shovelfuls.

for school-ground decoration, very likely of the formal sort. Here, where plant lines must harmonize with architectural lines and a color scheme of continual bloom be carried out, the training of a landscape gardener, or the advice of an expert, is necessary. But if the outline of such a



Vacant Lot in Louisville. The First Planting

garden be prepared, the teacher can follow it; the children can help in cultivating the hedges, trees and flowers. The garden becomes an object lesson and pleasure to the neighborhood and of permanent and increasing value to the school. To the children, it will be a means of development in more than one direction.

A pretty story is told in connection with the formal garden* of the Watterson School, Cleveland, Ohio. At the third clipping of the privet hedge, the cuttings were taken into the schoolroom and the children were asked if they



[1] Vacant Lot in Louisville (see opposite page) After Several Seasons' Planting

cared enough for their hedge to think that other

* The formal decoration follows the vertical and horizontal lines of ornament and the color scheme of the school building; vines are planted only in the deep angles of the building with the intent to so train them as to make a solid band of green about the base of the building up to the first horizontal lines of white stone trimming. Stiff plants and trees of upright growth carry out the vertical lines while the red and white in the building is repeated in the tan covered playground and in the continuous bloom of pink and white flowers.

children in a distant school building would also like to own one. They were quite sure that a hedge like theirs would be much appreciated. The curator of the school gardens then explained that if the Watterson children were willing, besides giving the cuttings, to do a little work for those distant schoolmates, the latter could have a hedge. They cheerfully agreed to help. For busy work, they stripped the leaves. Then, they gathered the cuttings into groups of twos and threes, of fives and tens, and then into fifties. These large bundles were sent to another school where the children would lend their cold frames to "bank" or house the cuttings during the winter and to give them an early start so that the new hedge would be ready as soon as possible to make rapid and sturdy growth. Some of the children in the Watterson school were given the stripped leaves, with which they were told to lay out on their desks designs of any shape. Later, there was a little nature study talk upon the construction of the leaf and how it serves the parent plant, and attention was called to the difference in color of the upper and under sides. The children were asked to remake their designs using the two shades for color effect. They were promised that they would be shown how the young plants had lain dormant through the winter and how they started into life in the early spring, and were told that they could visit the other school to see the hedge which they had prepared for its boys and girls.

The story suggests gardens for special purposes; as for preparation for truck farming ("training gardens"); for exchange of plants; for forcing; for nursery or forestry purposes; or the kitchen garden which might be attached to a school where the cooking courses were particularly good. In connection with any of these gardens, there might be a few flowers or a floral border so that the work could be partly individual, partly co-operative. In the kitchen garden there could be in addition, observation plots showing sweet herbs, grains, flax, hemp and cotton, or the raw products necessary for the commonest household tasks. Observation plots on a large numerical scale are necessary in botanical gardens laid out to show the classification of plants by families or according to their industrial or commercial uses. Here again, plots can be apportioned to individual children, and special cultural directions may be given to each when necessary. The exchange garden above referred to is carried on perhaps as much for the benefit of the parents as for the little ones. It is a central garden to which men, women and children can bring their extra or duplicate plants and exchange them for those of which others had a surplus. In Cleveland such a garden made in one year 20,000 exchanges. That means not only a good deal of pleasure, but much return for little money.

No city offers better opportunity to study the various kinds of gardens than Cleveland with its

nine school gardens and the stress it lays upon school-ground decoration. Miss Miller, in the Watterson and the new Technical High Schools, gives two excellent examples of formal planting, and about many of the older school buildings, some of which present rather hard propositions for the gardener, there are good decorative effects. Of the nine gardens, Rosedale* alone approaches completeness. Among the others, for lack of space, different kinds of gardening are divided. In addition, Cleveland has gardens on vacant lots and one, the Training Garden, conducted by the Home Gardening Association. At present, the work in the last named is divided between the junior and senior boys. It is, however, the intention of the association to develop a graded course of three or four years, so that a boy may here or on a farm, which will later be connected with the garden, learn enough agriculture to earn his living as a truck gardener or be inspired to find his way to an agricultural college, if he wishes to study general or special farming. Already the association and its friends have rewarded one boy by a scholarship at the Wooster State Agricultural College and expect to appoint him assistant in the Training Garden because being city born and bred yet trained in agriculture, he can attract and teach city boys effectively.

A celebrated physician and neurologist tells us that exercise of the muscles is absolutely necessary

* See Appendix A, Note 3.



THE NEW TECHNICAL HIGH SCHOOL, CLEVELAND, OHIO

to develop a healthy brain, to prevent imbecility, "for all thought has a motor side or element."* It is upon this demonstrated proposition that the educational value of manual training is based. It cannot be too often repeated that the brain should be trained in childhood not only by intellectual processes but by the development of the smaller muscles, especially those of the hands, by the constant requisition upon sensory and motor nerves, and by the constant quickening of sense perception. The result is intellectual power. It is psychologically sound, then, to propose hand training for those mentally deficient, provided that what is proposed is within the grasp of their low mentality.

With some imbecile children tools might be dangerous to themselves or to their fellows; with those less mentally deficient, the simplest forms of manual training may be undertaken provided they require only such amount of thought or work as shall gently and gradually stimulate the brain. Simple garden work, varied in requirements from cleaning up paths, picking flowers for bouquets or spent blossoms lest they go to seed, and tasks as simple, up through the scale to more exact or difficult duties, offers hand training and gives pleasurable hours of work which may be divided into periods suited to the individual strength and fitful moods of the feeble minded. Thus in schools where the mentally deficient are

* Sir James Crichton-Brown.

segregated, the school garden may supply the place of manual training. Its plants must be hardy and of simple culture, and its system and method of work very elastic. Moreover, its products will fit in at the noon luncheon which such schools frequently provide, for the children can



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CRIPPLED CHILDREN FARMING IN THE HEART OF NEW YORK CITY

supply soup greens and salads, and brighten both table and schoolroom with their flowers. The garden work will provide health-giving physical exercise out of doors that can be regulated to individual needs.

To still another class of children largely cut

off from normal living, the school garden comes as a boon. In one large city, a certain number of plots were divided off for a group of deaf and dumb boys from a public institution. These lads, from twelve to fourteen years of age, were given plots 10 x 45 feet. They cultivated the same crops as boys who had worked one or two years and had risen to the second and third grades in the garden work. The asylum boys took their instructions from the blackboard, found their tools by number in the toolhouse, and went about their work in happy silence. An occasional gesture or simple demonstration from the monitor who supervised their section was all they needed. Their beds presented a higher average in appearance than those of any other class. The class for cripples, at DeWitt Clinton Park, New York, has already been alluded to.

Here also may be mentioned gardens maintained in connection with detention schools, or homes for morally delinquent children. In the former, the garden must be conducted on very simple lines, because the children stay for short periods only. Sometimes there is a long period of waiting for suitable conveyance to the home or prison to which they have been sentenced. During this time the boys can cultivate the garden. Those who have had such an opportunity seem to enjoy the work and are loath to leave it. One small boy, so repeatedly up for punishment that it was known his sentence would be severe, made such a decided

improvement in manners and showed so strong a love for the garden work, that, as he was about to be taken to court, his teacher slipped into his hand a bit of paper and bade him give it to the judge. It read "This is my best digger," and bore the teacher's signature. The judge upon weighing its mute appeal sentenced the boy, not to the reformatory among all sorts of criminals, but to a farm for refractory boys, where the environment was better and safer than his own home. When last heard from he was a happy, contented little fellow striving to deserve the opportunity to live and work upon a big farm. It was Dr. Hodge of Clark University, I think, who once said that the quickest way he knew to keep our prisons and reformatories empty was to give every boy a piece of ground, however small, to cultivate for ten years of his boyhood. Last summer, in Providence, an incorrigible truant had one of the prize gardens.

Under gardens for special purposes, one might mention those in connection with day camps for tuberculous children, such as the one conducted during the summer of 1909 in connection with Bellevue Hospital, New York. Each day some fifty children were gathered there on the floating hospital boat moored to the dock, with a gangway crossing to that part of the hospital yard which formerly held the dump heap. Thanks to the interest of the International School Farm League, the Woman's Auxiliary of the hospital, and the

authorities of the latter, who gave the use of the ground, a school garden was laid out with some fifty little 4 x 8 beds for vegetables and flowers, and space for more flowers in the borders. Under the guidance of a skilful teacher, who had been trained in the DeWitt Clinton Park garden, the



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GARDEN AT BELLEVUE HOSPITAL, NEW YORK CITY

children were allowed to cultivate their plots from half an hour to an hour each day according to their strength. With such occupation the hours lost some of their monotony, were happier, and brought better health and more resources and pleasures, not only for the present but for future days.

As in the city, school gardens of different kinds

may be separated or may overlap, or be found represented in a large model garden, so, in rural districts, there may be combination or singleness of plan. The school garden farm emphatically has its place in manufacturing towns, in many villages, and in distinctly rural communities. In the country school, except for the work of the youngest children, the school farm of the city will undergo modifications in order to adapt it to the practical needs of a farming community. These modifications will be treated under the discussion of experimentation or trial gardens.

In the country, school-ground decoration will not be of the formal kind frequent in cities. Where the schoolhouse is situated on the roadside, the garden should aim to become a part of the landscape, and the main lines should take their emphasis from the natural contour of the land and its salient features. Whenever the school is in a village or in the open country, the decorative scheme of the yard through which the building is approached should be founded upon the A B C of landscape gardening; it should avoid a spotty appearance by,

A. Keeping lawn centers open, hence restful.

B. Planting in masses so as to get large effects; and by careful arrangement of foreground and of color and texture of foliage, and avoiding "legginess" or bare, scraggly trunks and stems, securing tones of deep-

ening color and harmonious blending in shape, size and texture of leafage.

C. Avoiding straight lines which have no place except in formal gardening. Curves in paths and roadways should seem to have a reason for some bend, though it be only a group of bushes or a tree.

Sometimes the easiest and most tactful way to secure a school garden in a remote community is to begin with a topographical or chart garden; that is, one based on exploration of the surrounding country. Such would naturally lead up to interest in a wild flower garden and to the decoration of the school grounds. Where the schoolhouse is an ugly building on a small, unsightly lot, and where farmers have no use for "fads," the topographical garden may be the only one possible. It may be well, therefore, to make very clear what is meant, especially as through such means a very conservative community may sometimes be led to take a lively interest not only in improving the school premises, but in permitting an experiment in vegetable gardening, which later may prove a boon to both adults and children.

Most children are glad to tell you where a unique tree, a noticeable bush, or rare flower is to be found. With the schoolhouse as a starting point, map out the way to find it. Gradually enlarge the drawing to indicate the contour of the land as the children describe road, hill, swamp or plain. Mark upon it the noticeable trees or

houses or even big rocks or boulders. Later fill in the map so as to suggest the kinds of growth in the bordering woods or meadows, first the larger sorts and then the smaller, gathering as you chart them topics for talks to which a part of one day each week may be given. At these times, the teacher should help the children sort out the knowledge which each has contributed and should amplify and intensify it for all. Some of the children will fetch specimens. With a little encouragement, they will be willing to bring enough earth, if necessary, to start a wild flower garden, like the one at the George Putnam school previously mentioned as the first in America, or the 10 x 100 foot strip of wild flower garden at the Cobbett School, Lynn, Mass., where several hundred shrubs, woody vines, ferns and herbs are gathered. "From hepatica and bloodroot to aster and witch hazel they flourish in their season." Some of the rarer plants were brought or sent from central New York, from New Hampshire and from distant parts of Massachusetts.

However, one need not in any rural district go far to find suitable material for fern or wild flower border, for shrubbery or for trees fit to be transplanted. There are few plants that, like the arbutus and fringed gentian, rebel at civilization, and many that increase in size and brilliancy under cultivation. That they are hardy and persistent when once rooted, twenty years' experience in gardening in a city back yard

has proved.* Dutchman's breeches (dicentra), hepatica, spring beauty, anemone, jack-in-the-pulpit, columbine, adder's tongue, asters, golden rod, violets of several kinds, the rose marshmallow and the wild sunflower all bear transplanting and cultivation. Raspberry vines and blackberry bushes can be utilized for the garden as well as wild grape, woodbine or Virginia



Rock Garden, Audubon School, Dubuque, Iowa

creeper, bittersweet, clematis, and some of the other native vines. The hobble bush has beauty of blossom and leafage. Thorn apple, flowering dogwood, the elders, wild barberry and bob sumac provide good shrubbery and several of

* Many of the early spring plants were given warm and sunny places in winter and early spring, and sheltered by the dense shade of grape vines in the summer and early fall.

them furnish rich color and effective outlines in the fall and winter. The mountain ash and the white birch are treasures, and many a seedling elm, oak or maple is easily found.

In some way establish a bond of interest between the school and the home growing of flowers. Start a plant or two in the schoolroom window.* One teacher in a rural school began his flower garden with a single fuchsia and in two or three years had a large family of plants including many grandchildren of the original flower. In fact, that family became so numerous under judicious slippings that its descendants were farmed out or given for adoption into the homes of grateful children who frequently offered slips of other flowers in return. To ask for a slip is in many communities a most acceptable compliment to the successful grower of house plants. Many of the begonias are easily propagated from pieces of stem or leaf, and their bright colors and unique leafage make them universally pleasing. For outdoor work about the school ask for roots of lilac, forsythia or yellow flowering willow, flowering almond or flowering quince, bridal wreath or peonies.

Strive for a clean school yard as you would for a clean schoolroom, but do not stop there. Beauty

* At the least, one can have that always interesting thing, an eggshell garden, for it needs but a few seeds, one or two of them planted in each shell that has been filled with a little rich soil. Later the seedlings may be transplanted into the school or home garden.

has its moral effect on a child. It is useless to expect untarnished morality from children whose parents provide ramshackle outbuildings and schools uninteresting and repellent outside and in, where no playgrounds exist and where no provision is made to keep investigating minds safely busy when not occupied with lessons. Clothe your outbuildings with vines, screen them with groups of trees, plant your grounds with things that invite the children to note their growth or to enjoy their welcome shade. Make school a delightful place in which to linger because it has so many charming interests. Childish activity whether of mind or body needs direction. As in the childhood of the race morality was an unknown thing, so too in childhood, some of the evils that we most deplore are at certain ages largely the outburst of the investigating spirit spending itself upon what is near at hand in default of better, happier things with which to fill otherwise vacant moments.

No scheme or plan for the decoration of the rural school can be completed in one season, but a beginning, pleasing to the eye, is a good thing, a fertile seed of usefulness.

In rural districts, gardens for experiment or sample plots for observation are sometimes possible even on a relatively microscopic scale. Classroom demonstration of the qualities of soils and other experiments may illustrate the growth upon these small plots. The country boy, of

course, has no use for farming on tiny beds that to city children seem veritable plantations. Such baby farming and such instruction in the first use of tools as would be welcome in the city would be ridiculous in the country. Possibly a farmer's boy hates the whole business of farm-



Canadian Boys Spraying Potatoes

ing and longs for the day when he can get away from it and enjoy life more as he fancies his city cousins do. His father, perhaps, has no use for the new school frills, and does not want interference or intrusion on his home ground. But it may be feasible to introduce school gardening by suggesting that one boy or group of boys should conduct

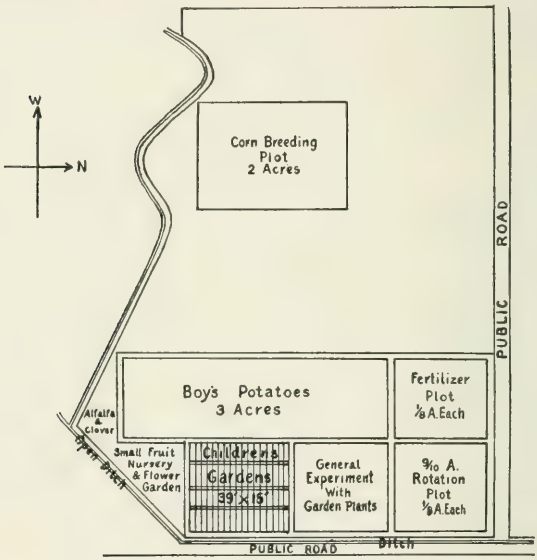
home experiments, as, for instance, with two apple trees or two patches of potatoes, spraying the one and not the other and having different children make occasional visits to compare notes.*

On the other hand, throughout New England and New York, many schoolhouses have barely ground enough for the children's recess. Yet even so, if a few feet of ground could be planted, for example, to cabbages or potatoes, an experiment could be conducted that would touch the taxpayer's pocket, dissolve the shell of prejudice, and win at least a grudging acknowledgment that there is some merit in school gardening. Such a plot could be divided into halves and one part planted with selected eyes from large, well formed potatoes while the other half should be seeded with eyes from small or indifferent stock. One-half of each division should be carefully sprayed against the ravages of the potato bug. The other half should be left to care for itself. The result would show the relative value of the crops in a most convincing way. Ten cabbages would demonstrate the ravages of the common cabbage butterfly and, incidentally, of the cabbage root maggot and the flea beetle in localities where they abound. Four

* See Appendix A, Note 4, for Dr. Robertson's offer of prize money for wheat and oats grown by the children of Canada, and notice the bearing of this upon the school garden work.

Where there is a branch of the Grange it is well to ask it, individually or collectively, for suggestions and for aid in improving the school premises. See Appendix A, Note 5.

heads of cabbage should be carefully screened by one piece of cheese cloth or netting and four by another, while two may be left uncovered. Those uncovered will be exposed while young seedlings and tender plants to attacks of the beetle and the maggot. Those covered will be pro-



CANBY, MINN., PUBLIC SCHOOL GARDEN AND EXPERIMENTAL FARM

tected from the cabbage butterfly; but it is proposed to introduce under one of the screens all the white butterflies of this variety of pierids which the children may catch. Later, the riddled leaves of one group of plants will show the ravages of the caterpillar hatched from the but-

terflies' eggs, and the life history of the insect may be presented as a complete story for the children.

The Department of Agriculture, Washington, D. C., furnishes on request, brief, accurate, and popularly written leaflets on the cabbage butterfly (Farmers' Bulletin No. 142) and one on potato culture (No. 35).* Many other bulletins on various subjects are issued by the department, a list of which will be sent upon application.† State experiment stations also issue free bulletins, and their experts stand ready to answer any questions in regard to soils, plant or insect life. In writing for bulletins, it is well to explain whether those treating the subject from the popular or from the scientific side are wanted, as many stations issue two series. If specimens are to be sent for identification a note should precede them. If it be concluded with a word of thanks for the favor about to be conferred and followed by a postal card acknowledging the information when received, the courtesy is appreciated by the busy officials whose letters mount daily into the hundreds, but who like to know that their answers have supplied the needed information. One man said "Experience teaches us that we cannot expect this, but we do prefer it."

* See also Potato Culture in Cornell Agricultural College Leaflets Nos. 196, 140, and Appendix A, Note 6, telling results of experiments by Canadian children.

† See Bibliography.

Courtesy is pretty sure to be remembered and to bear interest.

In our western states much has been done to improve rural school conditions. Many counties and normal schools publish bulletins, some of them free, others at slight cost, most of which are very helpful. In the west and south the famous



School Garden, State Normal School, Kearney, Nebraska

corn contests are carried on among clubs of farmers' boys.* In Nebraska, some 2200 boys have engaged in growing seed corn in prize competition. One state offered a two weeks' trip to Washington, D. C., to the boy who won first prize, and

* An interesting account of the work of Dr. Seaman A. Knapp, of the Bureau of Plant Industry, U. S. Department of Agriculture, among farmer boys of the south, will be found in *The Outlook*, Feb. 5,1910, pp. 279–280

each county added a premium of $150 if the prize winner was found among its own lads. In Illinois, apart from corn contests betterment of rural school conditions and the opening of school gardens have been actively pushed, especially in Winnebago County under Superintendent O. J. Kern. Other counties have followed the lead, and there has been a steady development since 1906 when Marion county had ten school gardens, ten per cent of the schools in McHenry county had gardens, Coles county had a garden of one acre for its graded school, Pike county had a garden, and Peoria county had twenty-five in connection with rural schools.*

Many schools in country districts could follow the custom adopted in the cities of giving out seeds for the children to plant in their home gardens, and the teacher's social call might include supervision of these. Speaking of the work in Concord Normal School, Athens, W. Va., where seeds are distributed to the children to be planted in home plots with supervision and advice by the head of the department, the principal, Mr. C. L. Bemis, writes:

"The reason we are doing our work in this way is because we have no ground of our own for such work. I think I should prefer the way we are doing it, anyway, because it makes the parents more interested in the work, and all the child raises is his own. *It is necessary, however, for him*

* Kern, O. J.: Among Country Schools, p. 82.

*to return seeds to the school for those taken away from the school. He has to carry the plant through from the seed to the seed."**

In the south, also, attempts are being made to interest the farmers' children in flower or vegetable gardens of their own. Among the central states, as in Ohio, the work in this line sometimes does not take the form of technical instruction in agriculture, but rather of teaching that shall open the children's eyes to the growing life about them. Sometimes this is done by reading from the works of such authors as Riley, Carleton, Burroughs, who write of the farm, woods and fields; sometimes by stories of what men like Burbank have done, or of the achievements of men like McCormick who have invented labor saving tools. In garden and nature study work the object is to make the country boy realize the natural forces with which he must deal, the wonderful changes that go on about him; to lead him to scientific understanding of his environment, appreciation of his economic position, and to realization of the aesthetic enjoyment possible in his surroundings.† Such intellectual training will not carry

* The italics are the author's. Following the circuit of the free traveling libraries in seven of the southern states, over a hundred school gardens have been established in connection with the rural schools.

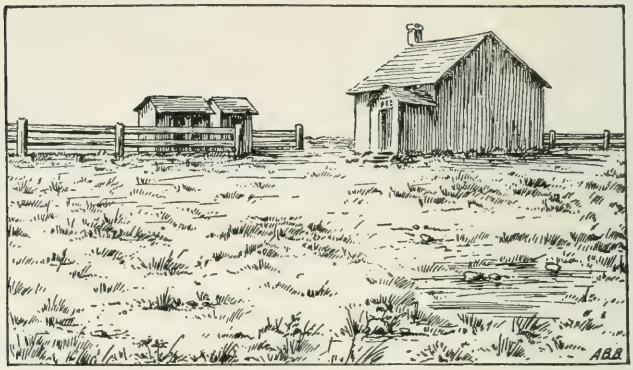
† "If the farmer as he trudges down the corn rows under the June sun sees only clods and weeds and corn, he leads an empty and a barren life. But if he knows of the work of the moisture in air and soil, of the use of air to root and leaf, of the mysterious chemistry in

his interests away from the farm, as is so often the case in school life now, but will provide breadth of culture, make rural life fuller and give a mental alertness useful for all time, whether the boy remains upon the farm or enters industrial or professional life.

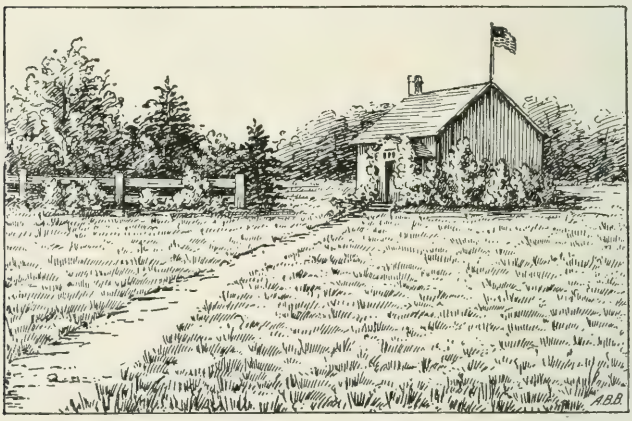
We of the north Atlantic coast pride ourselves upon the little red schoolhouse, and the church steeples that crown our New England hills; upon the virtue that came out of them and went into the making of our country. But this is now largely a matter of historic pride and poetic sentiment only. Today the New England schoolhouse is too frequently a blot on our civilization; a raw, ugly object, spoiling the beauty of the landscape, indecent in its surroundings; of rude, unlovely exterior, with only the flag as an inspiration; and with a dismal, uncomfortable interior for tasks that have but little vital connection with the life which the children lead. Even in the largest buildings and with the wider curriculum of the schools of the small towns there is no place for the development of the farmer's boy as there is for the child of the merchant, mechanic, artizan or artist. There is no outlook toward the agricultural

the sunbeam, of the vital forces in the growing plant, and of the bacteria in the soil liberating its elements of fertility; if he sees all the relation of all these natural forces to his own work; if he can follow his crop to the market, to foreign lands, to the mill, to the oven and the table—he realizes that he is no mere toiler." Felmley, David: Agriculture and Horticulture in the Rural Schools.

college as toward the college of arts and sciences or the special professional or trade school. "Manual



WHAT IS!



From *Farmers' Bulletin*, No. 218

WHAT MIGHT BE

training has brought the shop and school together but the farm and school are still far apart."

	No Lime	With Lime
(1)	Nothing	
(2)	Nitrate of Soda	
(3)	Acid Phosphate	
(4)	Muriate of Potash	
(5)	Complete Fertilizer	
(6)	Nitrate of Soda and Acid Phos.	
(7)	Nitrate of Soda and KCl (Potassium chlorid or muriate)	
(8)	KCl and Acid Phos.	
(9)	Street Sweepings	
(10)	Street Sweepings and Complete Fertilizer	
(11)	Cultivated every 10 Days Unsprayed	Sprayed
(12)	Cultivated every other Day Unsprayed	Sprayed

Experimental Plots. School Garden, Roger Williams Park, Providence, R. I. Courtesy of E. K. Thomas.

A Suggested Experimental Plot.

It is possible to make the school and its surroundings more attractive, to give its dry routine a closer connection with the children's daily lives, and through it to add new interests to the life of field and wood. It does not need a nurseryman to give a lesson in transplanting vines or bushes or young trees; to set out a growth of baby pine or red cedars for a wind-break or rapidly growing sumac for a screen; to plant the royal aster or glowing golden rod in a dismal corner, or train the clematis to cover bare walls or fences. This much can surely be attempted and possibly also a small vegetable garden or trial plots on a larger scale for work with grains and fertilizers. Experimental plots are better on the rural school ground especially where land is cheap, for they can be made to bear directly upon the economic interests of the community. Moreover, the cost of land increases, and if its purchase is deferred from year to year in rural towns, whole districts become built up and we soon have the problem of the congested city district.

The experimental gardens while intended first of all for the wholesome, full development of child nature, frequently aim to be feeders for the agricultural colleges or high schools. They purpose to deepen in children a love for country life and to teach them that the farmer's calling offers equal opportunity with other livelihoods for well rounded development, pleasant work and successful effort.

CHAPTER III

SOIL FERTILITY

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"Agriculture is the oldest of the arts and the newest of the sciences."

"Finely divided nutritious soil, with a reasonable supply of water, is the prime requisite of successful gardening."

"Perfect agriculture is the true foundation of trade and industry,—it is the true foundation of the riches of states."

TO become a successful teacher of school gardening it is not necessary to be an agriculturist, botanist, entomologist, psychologist or chef; but a knowledge of the fundamental principles of agriculture is needed, in order to give plants their right soil, and to protect and encourage their growth. Elementary botany is needed to make clear to the child processes of growth, the adaptation of parts to development, and the life history of the plant. The teacher should have sufficient knowledge of entomology to discriminate between the insects that are beneficial and those that are hurtful to plant life, and to tell their life story. She should be enough of a cook to give practical lessons in preparing the food raised in the garden, and to be on the watch to introduce the use of new vegetables, especially

those suitable for salads or greens. Further, the gardening instructor need not be a trained psychologist, but must know how to present the facts of the garden so in accord with the laws of association as to call forth the child's quick sense for analogies, to hold attention, to whet curiosity, and



Children Who Need School Gardens

to grip the memory. Otherwise, the garden will only teach about growing plants and not develop perception, judgment and stronger moral fiber.

There are constant illustrations of the fact that these aims can be attained, and a garden that falls short of such results is a failure. In Carleton

county, Canada, 71 per cent of the children from schools with gardens passed their high school examinations, while from schools without gardens only 49 per cent passed. This was a gain of 22 per cent during the three years the Macdonald school had been established there. American teachers also report growth in mental alertness, in the sense of responsibility for school property and appearance, and less disorder and naughtiness from the exuberance of animal spirits that now find a safe vent in gardening. In the large garden of the National Cash Register Company the mentality of the boys who entered as farmers was increased 30 per cent, while their morals so improved that city lots, safe at last from their depredations, rose in value from $200 and $300, to $400 and $600.

It is fundamental for school gardeners to understand how to create soil fertility and preserve reasonable moisture. Upon these, more than upon anything else, successful crops depend.

Soil, "that part of the earth which can be cultivated and in which plants can grow", is disintegrated rock with more or less decayed and decaying organic matter—vegetable or animal—mixed through it. Such matter is called humus, or sometimes "vegetable soil" because so largely composed of decaying vegetation. When soils are divided according to their texture, they are known as gravel, coarse sand, medium sand, fine sand, very fine sand, silt, clay and

"vegetable soil". The most common types of nearly pure humus are the leaf mold of the woods, or the rich, soft, friable earth, still showing its origin, found at the bottom and under the edges of every old woodpile. From this almost clear vegetable soil, humus in varying quantities runs through the different varieties of soil mentioned, almost entirely disappearing in the coarser sands and gravel. It is of the utmost importance to plants because it not only largely furnishes them food, but through the chemical changes it is constantly undergoing, it helps to break up the more insoluble mineral constituents of the soil into finer particles, and thus tends constantly to increase both the supply of plant food and the area over which and through which the tiny root fibers can make their way. Herein lies one of the values of well-rotted, coarse barnyard manure over the artificial fertilizers. The manure helps the plants mechanically as well as chemically.

So important is the humus that its relative quantities determine the division of soils according to their productivity.* A good loam, an excellent soil for most growth, is approximately one-third gravel, one-third clay and one-third humus. To this, land in a farming country

* There is still another division of soils according to their formation. Their names tell their story,—sedimentary soil, transported soil, alluvial soil, glacial soil and wind-formed soil. On the leeward side of arid lands and deserts the soil, carried there by the wind, is often very fine and fertile.

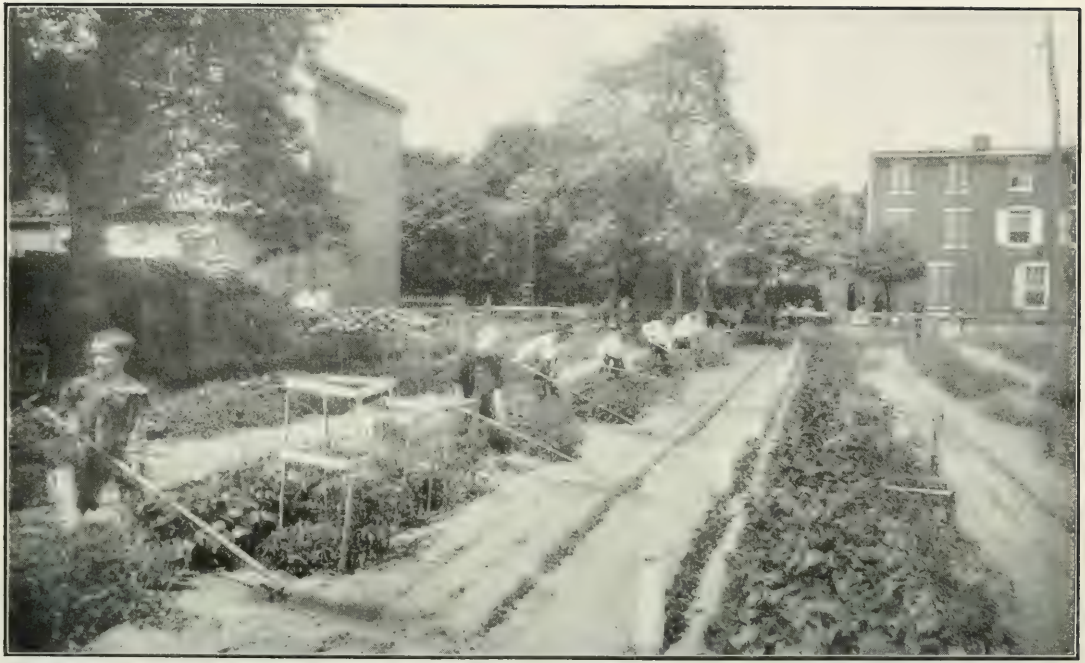
may very likely approach, or readily be made to approach by the use of ordinary fertilizers. According to soil fertility, a division is made into (1) sandy soil, containing 80 to 100 per cent of sand; (2) sandy loam, with 60 to 80 per cent of sand; (this is light to work, and if plant food be added, is quicker in results, hence desirable for truck farming); (3) loam with 40 to 60 per cent of sand, the best all round soil (if air dried, it will weigh 100 pounds per cubic foot; while average garden soil weighs about 70 pounds); (4) clay loam with 20 to 40 per cent of sand; and (5) clay, a heavy soil, likely to be cold, with from 20 per cent of sand to no appreciable amount.

For a number of reasons a light sandy loam is preferable for children's gardens. It is less subject to weather conditions than the other soils. Consequently, it can be worked at almost any time, as, for example, earlier in the spring and sooner after showers. The children can handle it more easily than the colder clay, which tends to become hard and lumpy, to hold pools of stagnant water, and to form slippery paths where a tumble might be disastrous to clothing or to plants. A light loam will grow and rapidly mature, with comparatively little special treatment, the plants usually selected for the children's beds, as well as nearly all those chosen for the observation or sample plots. It is the least difficult soil; consequently it is the standard to which one should try to attain when soils on school garden sites have

to be improved. There is still another division of soils based upon the ease with which they may be worked. Sandy soils are usually called "light" because they are easier to work, though in equal quantities they really weigh more; for a cubic foot of dry sand weighs 110 pounds and the same amount of clay about 80 pounds.

Soil, as thus far discussed, is that part of the earth's surface sometimes called the "top-soil" in distinction from the "subsoil". As the top-soil practically holds all the humus, the subsoil is virtually non-nutritious, disintegrated rock. Accordingly, when we speak of soil, we usually mean the top layer, whether a few inches or a few feet in depth. This depth is all important to the gardener, for under no circumstances must the top-soil be destroyed or the subsoil be turned over upon it. That will be the result if ploughing is too deep or if, in grading, the top-soil be leveled off or subsoil be dumped upon it. Between these two soils there is usually a difference in color and texture.

A gardener or householder should see that in the garden or about the home grounds every particle of the top-soil shall be preserved. So important is this, that a wise husbandman will not harrow his land on a windy day lest the wind carry off in clouds of fine dust the food particles so desirable for his crops. In grading, it is sometimes necessary to skim off the top-soil, level, and replace it. Where the top layer is thin, and the



THE RAKING-DRILL, CARROLL GARDEN, PHILADELPHIA, PA.

gardener thrifty, the top-soil of paths, as they are made or cleaned, is thrown on the beds and made in some measure to replace soil that has been worn out or removed by adhering to the roots of weeds and rubbish. A vegetable garden can be built up on four inches of top-soil by avoiding deep root crops and by frequent fertilization to replace exhausted plant food. A flower garden, carefully selected for shallow running roots, can be built upon less depth. But grains require more as they send their roots from two to four feet deep and corn requires even six feet. It is therefore essential to recognize and conserve this top layer of soil.

Finely divided soil may, as in the case of soils of reasonable fertility and lightness, be obtained by a mere mechanical division and multiplication of particles, by ploughing, harrowing or by deep spading and raking. If an experienced ploughman is not to be had, and the area permits, by all means thoroughly spade it. Land should be prepared in the fall. It should be ploughed evenly, deeply and carefully, turning in well rotted manure that has been spread about three inches deep. This depth of manure is necessary for the rich soil demanded in a school garden, where the same soil may be required to carry successive crops in one season. Ten cords to the acre is a farm average, and spreads a layer of one-quarter of an inch. Market gardens often use from 25 to 30 cords; truck farmers on small areas use still more.

If fresh, it may be turned in in less quantity and the land allowed to lie unplanted for some time, or it may be heaped in piles, wet down and allowed to decompose for several weeks. In warm weather such piles should not be left to breed flies, and they should at all times be mixed with soil to prevent the escape into the air of nitrogenous gases from the decomposing nitrogen compounds. Fresh manure will burn out seeds and scorch plants.

Land is better with a so-called cover crop of some sort, often winter rye, which in the spring may be turned in early as green manure. After a little opportunity for it to decompose, the ground may be ploughed or spaded and harrowed (spring tooth harrow), raked, and so put in order for the laying out and planting of the garden. Where a grass sod exists, it must be disc-harrowed in both directions and cut again and again before being ploughed in. If the school garden is not decided upon until spring, the land must be fertilized,* ploughed or spaded, and allowed to lie open a few days to air and sun before planting.

In respect to the suitability of a soil for cultiva-

* Commercial fertilizer for school gardens on medium light garden soil may be figured at 1 pint per 5 x 10 feet plot or 100 pounds per 100 such plots, provided it is an "all round fertilizer". Such a one would carry 60 per cent bone meal or dust (or 30 pounds superphosphate), 20 pounds nitrate of soda, 20 pounds muriate of potash. If fertilizer of one constituent only is used, bone meal is probably preferable. Pulverized sheep manure is an all round fertilizer and safer to use since it will not burn rootlets or many kinds of seed.

tion, the simplest test is to compress a handful, then, opening the fingers, give it a light toss. The compressed lump should show a light impression of the fingers. When tossed to the ground, it should fall all apart with the soil grains adhering in masses too small to be called lumps. If the soil is sticky, over wet, over heavy (clayey), coarse, or over light so as to fall in distinct grains (sandy), it will not answer the test.

A chemical test of the soil would give all the elements it contained and their proportions, but would not determine what portion of them is available for plant food. To be so available, there must first of all be a reasonable amount of water. Root fibres can absorb no food except as it is in solution in the tiny films of water surrounding each infinitesimal particle that goes to make up the little masses usually spoken of as atoms of soil. This film moisture is known technically as "hygroscopic moisture" to distinguish it from the capillary water which is held in the spaces between the soil particles by capillary attraction, and which is of direct use to the plant in carrying plant food from place to place. This capillary water finds its reservoir in the "ground water", which is the water that has percolated through the soil until it reaches an impervious layer, where it gathers to supply our springs and wells. To return to the hygroscopic moisture, where there is so small a quantity as

from three to ten parts of plant food in solution in one million parts of water, it will be sufficient to support plant life if it is constantly supplied. The process by which the food-laden water enters the root hairs and passes throughout the plant is called "osmosis". No crop will grow in a sandy soil holding less than 19 per cent of water, or in a clayey one with less than 38 per cent. As the arrangement of the soil particles bears a close relation to the agricultural value of the land, their number (varying in soils of different texture) will indicate in a general way the suitability of the ground for crops.*

The practical gardener or nurseryman will tell good soil at a glance, or what poor soil needs to improve it. A novice may find out by the physical test of earth taken from different parts of the proposed garden site. It is customary to take the earth out by driving a tube from six inches to a foot into the ground. Any kind of a tube, such as an old apple corer, or better, a boy's blow pipe, will do. The steps of the process of testing are as follows: (1) Thoroughly mix the specimens, unless they are very unlike (if so, test separately). Carefully weigh, noting first the weight of the receptacle (the best kind is an old, shallow tin

* As an illustration, grass and wheat thrive best in soil having 396,900,000,000 grains of clay to the ounce, while corn lands should have from 170,100,000,000 to 198,450,000,000 grains. Fifteen hundred pounds of quicklime to the acre will by its decomposing power (*not* fertilizing), change wheat or grass lands to corn lands. Such problems do not confront the ordinary school gardener.

pan), and the weight of it and the soil together. Then, over a low flame so as to avoid scorching or burning the earth, drive off the moisture it contains, weighing from time to time until a constant weight is obtained. Thus you will find the weight of water and by ratio its percentage in the soil. (2) Find the percentage of humus by heating for twenty minutes, sufficiently to burn out all organic matter as proved by again obtaining a constant weight. The difference between the constant weight of (1) and of (2) will give the weight of humus and its percentage. Then (3) test for the gravel and sands by sifting. The United States government uses a set of brass sieves. Homemade ones will answer, such as boxes with their bottoms replaced by fine wire gauze and by bolting cloth. Gravel will not pass through a wire mesh of less than two millimeters diameter. Coarse sand will not go through one less than one millimeter; medium sand, through one less than one-half millimeter; and fine sand, through one less than one-fourth, while very fine sand will not pass through a sieve of one-twentieth of a millimeter mesh or less. For separating the last two, bolting cloth of a mesh known as No. 5 and 13 may be used. The silt and clay are mingled and will be separated by the fourth step. (4) The silt and clay are carefully weighed, then shaken with a quantity of water and boiled for ten minutes or longer. Then they are allowed to stand until the heavy silt sinks to the bottom and

the clay in solution can be decanted off. The water in both is then evaporated and each in turn weighed to constant weight or to within one thirty-second of an ounce thereof. Soil grains of silt run from one-twentieth to one one-hundredth of a millimeter in diameter, and of clay from one five-thousandth to one ten-thousandth.* To complete the experiment, the weights of the gravel and of each of the sand residues should be found. Each of the varieties found in soil may be put in a small vial, neatly labeled with name and percentage, and mounted on a card. If humus and water of the determined weights be also placed in vials, the card will be a complete exhibit of the garden soil in its physical characteristics and approximate supply of plant food.

At first thought, it would seem as if the finer clay would furnish more plant food. It does hold more. The soil grains of a cubic foot of coarse sand will spread over one-fourth an acre, while those in the same amount of finest clay will spread over four acres. Consequently, the clay with its myriads of film surfaces will hold more water. But clay soils are so compact that water stagnates in them, cutting off the air that should go to the roots, tending to sour the ground and to develop in it mold and fungus disease. On top,

* The experiment can be shortened by a determination of the water, the humus, all the sands, and the clay and silt in one mass. Plants will not grow in over 80 per cent of sand, or over 60 per cent of clay.

clay will dry, cake, and crack open when the surface moisture is sunned out.

It is known that plants take from 50 to 90 per cent of their food, of which three-fourths is carbon, from the air. This carbon is derived from the carbonic acid gas, which is at least 30 per cent greater in the ground air than in the air we breathe. Where there is sufficient moisture in the ground to allow a free circulation, there is sure to be both a constant supply of air, of available plant food in the soil, and also a sufficiently deep passage of sunlight to keep plants healthy. Accordingly, if the garden site has too much clay and is soggy, it may be treated with quicklime to sweeten it* and break it up into finer particles, or with coarse manures and turned-in cover crops. Both will furnish readily available plant food and help to lighten the soil. Sand and even coal ashes, in reasonable quantities, leaves, and any organic matter, if decaying rapidly enough to quickly disintegrate, may also be used. Furthermore, paths can be laid to act as surface drains.†

If one has to deal with a too sandy soil, the need is for an admixture of clay and humus, which will act, as will also manure, to help conserve soil

* Five to ten barrels per acre. The sourness of soil can be detected by its turning blue litmus paper red.

† Land where the water stands in pools upon the surface must be drained by trenching or the equivalent as above; where water is held too freely the soil must be tiled. Occasionally, a small and perhaps temporary ditch will carry off the excess of water due to spring rains.

moisture. In such a soil, the nitrates are apt to be lacking; they are so soluble they wash away. Plants must have nitrogen, and their root fibers will accept it only in the form of nitrates in solution. One whole class of plants, however, the leguminosæ, of which the pea and bean and the clover are typical are an exception, for they possess the unique characteristic of bearing on their rootlets nodules in which dwell colonies of bacteria that have the power to take free nitrogen from the air and convert it into nitrates. It is well to remember that white beans and sand peas will grow in the poorest of soils, and that crimson clover is a good cover crop.* Therefore, if you have almost to construct a good soil, plant beans, and later turn them in.† Buckwheat is a good crop for poor soils. Crops with tap roots help to keep the soil open.

The prime object is to make a soil that shall be fertile, fine and friable,—in one word "mellow,"—and further to so control and utilize the natural water supply in the earth that the chemical compounds in the soil shall be held in suspension in the water films. This is absolutely essential where an artificial water supply, by hydrant or irrigation, is not possible. In aiming for a fine

* The reason for a cover crop is three-fold: to keep soils from washing away (as down hillsides); to keep their soluble foods from leaching out; and to add enrichment when used as green fertilizers.

† In localities adapted to them cow-peas are excellent for this purpose.



A CLEVELAND LOT—BEFORE CULTIVATION



THE SAME CLEVELAND LOT—AFTER CULTIVATION

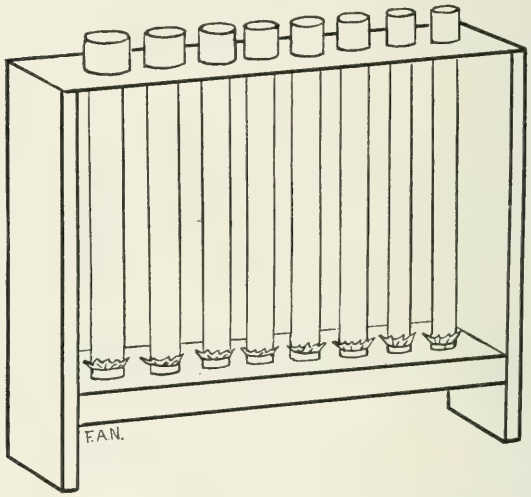
cultivation of the ground, remember that, at the rate of making two inches every ten years of the finest and most fertile top-soil, earthworms or angle worms are trying to help, and do not despise them.* Encourage them in the garden and do not neglect the lesson that these little ploughmen teach. They digest earth and vegetable food through their strong, muscular bodies, and literally grind out a new, rich soil. The large stretches of velvety turf that one drives over in approaching Stonehenge in the south of England, as well as the partially buried stones, testify to their industry through long centuries.

Exhausted soils teach the old lesson, that you cannot have your cake and eat it, too. Plants cannot take large supplies out of the soil without exhausting it. Therefore if the school garden is to devour plant supplies, intensive farming, or the constant supply of fertilizers each season and often during the season must be practiced, as is done in truck farming where many successive crops are repeatedly raised upon the same area.

In order to preserve soil moisture, dry farming is followed. By it all moisture within about ten feet of the surface of the ground may be called

* Earthworms in flower pots and window boxes are undesirable because their burrows allow water to run through the pot or box too rapidly. Watering the plant with lime water—a handful or 5 inch lump of quicklime to a 2 quart pitcher of water—will destroy them. An interesting experiment is to have a quantity of earth where the work of the worms can be watched; they can be fed with fresh grass, onion stalks, or even raw meat. See Darwin on Earthworms.

into use, and the greater part of that due to rains or heavy dews can be preserved. Two simple experiments will determine approximately the moisture conditions of the proposed garden. The illustration shows the apparatus, a set of chimneys in a rack, their lower openings covered with cheese-cloth. Soils of different textures



Device for Experiments with Soil

are placed to the same height in the chimneys. The porosity of different soils is shown by the rapidity with which the same amount of water poured in each chimney passes through its contents, and their power of absorption by the amount absorbed in passing. The capillarity of the soil may be shown by reversing the experiment, and

with the ends of the chimneys resting in water, allowing the water to creep up through the dry soils. Notice how long it will take water to creep up through six inches of good soil; how long to pass down through it.

The modification of the porous quality of soils is accomplished by the same means used in changing clay to sandy soils or the reverse. The capillarity of soils is modified by these same changes which make the soils more close or open, as may be required. But in the best of soils, capillarity has to be checked so as to keep down near the roots the ground moisture and to prevent its rise to the surface and its escape by evaporation. The simplest means is by dry farming; that is, by a dust mulch or dust blanket which is a covering of loose, fine earth from two to three inches deep over the whole surface of cultivated plots. It should be frequently renewed over small areas by the hand plough, or by the use of hoe and rake, or by the cultivating stick, and always as soon after rain or even heavy dew as the ground is workable.* "In general, soil should not contain more than 60 per cent of its water-holding capacity; *i. e.* at least two-fifths of the spaces should be occupied by air."

Where natural manure cannot be obtained, resort must be had to commercial fertilizers. Sometimes, however, street sweepings may be

* Over large tracts of land by the horse or steam plow set to the required depth with care to avoid cutting roots.

utilized, especially those gathered immediately after the snow of winter has gone. They contain some manure mixed with a soft muck, rich in humus, that has sifted through the snow. There is more than one successful school garden whose only available fertilizer was such street refuse. Some people object to such material as containing too many weed seeds. Undoubtedly there are a great many, because no food for horses can be wholly free from them, and birds also carry and drop them. Such means are among nature's methods for spreading green things over the earth. But cultivation and thorough weeding during the first six or eight weeks of a school garden should leave it in such condition as to require very little attention during the long summer vacation. The several days' work scattered through the summer, or a few minutes each day by a paid attendant will give the garden a presentable appearance and a fair showing of fall crops when school begins and harvest days are at hand.

There is a city backyard garden 45 x 100 feet that twenty years ago, at the death of the master of the house, had, besides hardy perennials and a variety of annuals and roses, more than four hundred species of wild flowers. During a period of perhaps a dozen years, flowers had been collected from the country round about. The owner was a well-known scientist and botany was his side interest. Each plant had been carefully taken up with a ball of earth so large as not to

disturb its roots or make it miss its native environment. It had been transplanted into a shady or sunny corner of the yard best suited to its nature. The garden even at the time of the owner's death was an old one, laid out in quaint box-bordered beds by an old Scotchman, who so thoroughly understood the value of fine soil that it became a saying that "there wasn't a spoonful of earth in the whole garden that hadn't been sifted between grandfather's thumb and forefinger." For twenty years no attempt was made to replace plants that died. Yet, today at least a dozen species of ferns and probably eighty kinds of wild plants may be found there.

For forty years it has been a household tradition that from blossoming of earliest hepatica or crocus until frost, there should be continual bloom among its hardy perennials and annuals. In the many changes during those years, it has sometimes happened that the beauty of the garden could be preserved only by a woman's spading it from end to end. It was never suffered to become a tangle, though sometimes for consecutive years it has had to go without fertilizer. It was for many years kept in order by the labor of a gardener hired for three days each spring and fall and by the frequent half-hour periods of weeding that could be given by one almost an invalid. In its earliest days, its bloom took prizes at the county fairs, and today, surrounded by city houses, the neighborhood

children call it Maplewood Park, ask to walk about it or, with their dolls, to sit upon its two settles to enjoy its flowers and watch its miniature pond, where grow, and early grew, the first pink pond lilies in that section of the country.

The Department of Public Works or its good-natured employes may be induced to give street sweepings to your garden. They should be piled or spread with a loose covering of earth, or if need be of lime. If piled, wet them down a little and leave them a few days to ripen. The covering will prevent the breeding of pernicious flies.* Before school gardens were heard of, we have occasionally seen boys gathering into home-made carts street refuse to fertilize their own, or more likely their father's, small backyard gardens. Recently, in crowded lower New York, I watched a small boy with a pointed stick industriously spearing street manure with a businesslike gravity that boded ill to the urchin who interfered with him or guyed him. The little collector had learned that it was filth only as it lay in the street breeding flies and disease. He had also learned that, in the wise economy of nature, though manure was a waste product, it was in itself full of rich food for the plants in his garden which if well nourished would grow into nutritious fruits and bright flowers.

* Some day, show a fly's foot under the microscope or an enlarged drawing of it. Emphasize the fact that it can carry typhoid and other disease germs and urge the humane killing of the fly.

To replace with suitable words as symbols of clear and true ideas the street gamin's vocabulary is a part of the school gardener's business. It is not always to be done by direct teaching. As Doctor Richard Hodge once said before a mother's meeting, when talking about teaching religion to children below the age of adolescence, "You



Hauling Street Sweepings, Louisville, Ky.

are not to teach religion directly to little children but as a natural and inevitable by-product of what you do teach and the way you teach."

In villages and rural districts several different kinds of animal manure may be offered as fertilizers. They vary in fertilizing value,* but

* See Farmers' Bulletin No. 21, Farmyard Manures.

stress upon their relative heating capacity is the more important. In passing, perhaps there should be a word of caution about using any of them that have been allowed to lie too long exposed to sun and rain so that their soluble constituents, especially their nitrates, may have leached into the ground and their other nitrogen compounds may have passed into the air in the well-known ammonia fumes. Neither should any fertilizer be allowed to become corrupted by mold or spores of toadstool or mushroom. In one instance that came under the author's observation, a florist lost two-fifths of a crop of greenhouse roses, meaning hundreds of dollars in lost sales and cost of coal, because his son hastily selected a pile of manure and mixed it with the fall supply of earth for the greenhouse benches. The boy had been sent to inspect the manure before purchasing. He had arrived at dusk of a fall day and visited the heap with a lantern. His hasty examination of it satisfied him. He paid for it, had it carted home, and had it in the greenhouse before his father discovered spores of mushrooms. The older man had picked up his knowledge of flowers. He thought he would better take the risk than lose time, labor and money. In the end, it was an expensive decision.

Among manures, that from cows is known as cold.* Hen manure is very hot and should always

* It contains the largest per cent of water (75.3) while sheep manure has less (59.5 per cent) and hen, least (56 per cent). These last two may have the same amount of nitrogen, nearly twice that of cows.

have a large admixture of earth. The sheep droppings in the large stock yards are regularly swept and put on the market in 25 cent boxes or at $2 per 100 pounds. Sometimes they are pulverized. The nuggets are apt to be fresher. On very small areas and in window gardening, sheep ma-



"My Garden Did Its Best."

nure is perhaps the easiest, cleanest and best fertilizer to handle. It can be used for indoor gardening, dry, one part to six of soil, or in liquid form, 1 pound to 5 gallons of water, and sprayed. The up-to-date farmer saves all liquid manure, for it is specially rich in nitrates, as the function of the kidneys is to carry off all excess of proteid

or nitrogenous matter.* Consequently all liquid manures must be largely diluted with water, and all commercial nitrates, either made into a weak solution or as solids, must be used most sparingly. No commercial fertilizer should ever touch the seeds or roots but should be thoroughly mixed with fine, loose earth.

Seedsmen and nursery men frequently sell an all round or "general fertilizer." For school garden experiments of small area, it is better to buy separate fertilizers, as nitrate of soda for the nitrates, wood ashes for potash, and ground bone for the phosphates, mixing them when necessary and just before use so as not to lose the more volatile elements. The reason is founded on a rough rule: feed nitrates for leafage and rapid growth; potash for root and fruit crops, intensity of color and increase in bloom; and phosphates for early maturity and plump seeds. Another rule is that commercial fertilizers, like tonics, give quicker results, while natural fertilizers give a slow, steady food supply throughout the season, and by their physical properties improve the soil for all time.†

Plants often profit by a little extra feeding at the start. Sickly plants and some others need a

* It is also rich in potash. It contains from three to five times as much nitrate and about nine times as much potash as the solid manures which hold by far the larger percentage of phosphates.

† Fertilizers may be rushed on for leafage crops and these rotated with seed or grain crops the following year and these again by clover

special diet. The two classes of fertilizers are often combined by using the natural fertilizer as the general food for the whole garden, and by adding in the row a small amount of special fertilizer; for example, a pint of ground bone or bone meal to a ten-foot row of peas, is mixed thoroughly in the bottom of a four-inch trench and covered with a light layer of soil, before the peas are planted, so as to give them a good start.

Of some seventeen elements required for plant structure, about half a dozen are all-important. For the needed small quantities of the others, the plant may be left to shift for itself. Of the important ones, oxygen comes from the air, from water and from chemical disintegration. From the chemical separation of water comes hydrogen. Nitrogen has been accounted for. From 50 to 90 per cent of the food of plants is taken from the air, and three-fourths of that percentage is carbon derived from carbonic acid gas. Potash and phosphates come from decaying animal and vegetable matter and from the fertilizers used. Lime, iron, sulphur and magnesium are indispensable.* They usually, however, exist in sufficient quantities in the soil, and are found in some measure in the fertilizers discussed.

or leguminous plants. Never use nitrate upon these nitrate making factories.

Commercial fertilizers are better used on clay soils for they are not as liable to be washed out and the chemical action they set up disintegrates the clay particles.

* Osterhout, W. J. V.: Experiments With Plants, p. 139.

One who understands the nature of the soil to be dealt with, and knows how to improve it can follow intelligently the cultural directions on nearly all seed packets or in catalogues of plants.* No theoretical knowledge, no word knowledge, can ever take the place of practical experience, but it can materially help to prevent gross errors. First, last and always, give your plants plenty of soluble food and keep their feet dry. Very few love any approach to a swamp. Give them good soil conditions. "Tillage," or cultivation, "is the stirring of the soil in order to improve it." Thorough tillage, whether with plough, hoe, or cultivating stick, means to kill weeds; to pulverize the soil that it may be open and uniform in texture; to create air spaces; to widen pasturage for roots; to conserve moisture; to admit sunlight and warmth; to admit rain, with its solvent foods; to cause organic matter to become humus; to turn over soil that its bacteria may better work upon it; in short, to create finely divided, nutritious, soluble soil particles.

* See list of plants for nearly all soil conditions and all sorts of places, in Appendix A, Note 7.

CHAPTER IV
COST OF EQUIPMENT

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COST OF EQUIPMENT

"A school yard planted by a gardener is good if the work can be done in no other way, but the one that best serves its educational value is planted by children, no matter how small the ground or how crude the result. It is in such a garden that moral teaching is accomplished."—B. T. Galloway.

A small boy in Massachusetts wrote "I took an axe and made the earth fine and with the coal shovel turned all over and over until it was all mixed together."—Letter to the head of the Children's Department, James Vick's Sons.

"The children cleared up the rubbish and tackled the soil with any old thing they could lay hands on."

THE purpose of this chapter is to give data for a fair estimate when computing an appropriation for a garden; to suggest a possible minimum cost; and to urge beginning a garden on even less where there is a courageous, intelligent enthusiast to watch over it. The chapter will also include some consideration of the use and care of tools.

The illustrations of an eighteen cent flower garden show that seeds need not cost much. Government seeds sent upon school requests have been spoken of, but whether the garden is in connection with a school or not, it is better not to depend upon such aid entirely; better to have the

national government associated in the child's mind as a willing helper in garden work rather than as a lavish provider. Whether seeds shall be provided free or bought by the children, is often a question of local circumstances. Assuming the old maxim "pay as you go" to be a very sound one, the

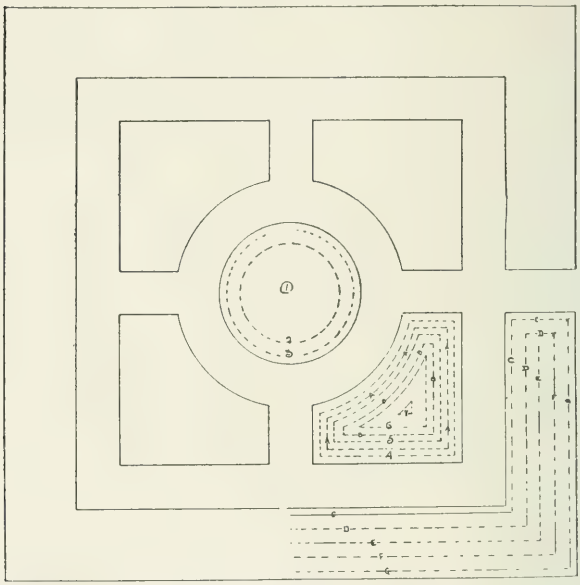


CHART OF AN EIGHTEEN CENT GARDEN

1. MARIGOLDS
2. BACHELOR'S BUTTONS
3. FOUR O'CLOCKS
4. ASTERS
A. PHLOX
5. CHINA PINKS
B. BALSAM
6. POPPIES
7. ZINNIAS
C. LETTUCE
D. RED BEET
E. PEAS
F. BEANS
G. CARROTS

penny packet, now put up by a number of garden associations and several of the leading seedsmen, makes both the flower and vegetable seeds for a



THE EIGHTEEN CENT GARDEN IN BLOOM

small garden come within an eager child's dime. His enthusiasm, however, should be backed by intelligent supervision and training. Enthusiasm alone or even with cash will not bring sure results. The teacher must have definite knowledge of the needs of plants. In its far reaching results, it is almost a crime to make a child work hard only to have him disappointed because of some fault or error in the garden work which the teacher should have known how to avoid.

Let us then consider some estimates of what a year's work costs. Two expenses loom up in connection with the yearly maintenance of every garden. They are those for the preparation of the ground, including, of course, plowing and fertilizing, and those for salaries. The cost of seeds, plants and other garden supplies (exclusive of tools) and of the material for nature study, need not be great. Even rental of land is usually not much more than enough to cover its taxes. There remain, as large initial expenses, tools, fencing, some kind of shelter under which to hold classes and conduct work, and the installing of a water supply. Locality, condition of soil, size of garden and the measure of its equipment* will all enter into an estimate of its cost. Yet one can perhaps gain some idea to base an estimate upon from the following data.

* Germany suggests that the size of a garden to serve the purpose of instruction be $\frac{1}{8}$ acre: if to include playground, at least $\frac{1}{4}$ acre.

A garden of $\frac{1}{8}$ acre (5445 sq. feet) large enough for a country school, may contain perennial and annual flower borders, class, sample and experimental plots, kitchen garden, forest and fruit nursery.

Including every expense of the garden and allowing for five hundred individual plots, 10 x 16 feet, together with a fair number of sample plots, on a tract of three and one-half acres, one of the finest gardens in the country asks from the friends who support it $5.00 per child per season of five months and estimates that the crop from each garden will return $5.00 or more to each gardener in vegetables alone. This garden is in New York state and its staff consists of a superintendent, two assistant teachers, a laborer and two assistants whose duty it is to give out the daily record books to the children, sometimes tools, such seeds as they may need, to keep the attendance, and sundry like duties. The National Cash Register Company when its boys' beds were 10 x 170 feet (now they are 10 x 100) figured that for 70 boys the expenses of keeping the land in order, hiring a gardener and making some display of flowers apart from the children's beds was $3500 a year.

A number of the estimates that follow are for gardens already established and used during the spring term of the school year and for perhaps several weeks in the fall. They do not include the initial cost of tools, or even fertilizer.* Toledo, Ohio, aside from the question of salary, figures that a school garden of one acre in extent with 300 individual plots (2 x 5 feet or 5 x 6 feet) can be run for six months each year at an annual cost of $25.

* Government seeds may be used in some cases.

The same amount, of which the Canadian government grants $20, is estimated to cover the running expenses of one (and probably most) of the Macdonald school gardens, having 126 individual plots, 5 x 10 feet, where the principal of the school and the regular teachers conduct the garden work.* Here in the summer, a janitor or laborer has general charge of the garden in connection with his other duties. In South Dakota an estimate of $40 per year, exclusive of salary, is given for a garden where work is done on from 35 to 40 group plots of 10 x 20 feet each. Texas, for gardens of from one to two acres in connection with some of her rural schools, figures the annual cost of maintenance at from $10 to $25. Some other estimates, such as one from New Jersey, figure the cost per plot as 30 cents per season and its return as 60 cents. At this rate 350 plots in a half acre lot would make the garden total $105 for the season. Another garden in the same state figures its running expenses for 38 class plots as $5.00 each per season, while an Indiana estimate was $1.00 per plot having six square feet. A Connecticut town supports a garden 45 x 80 feet, under volunteer teachers, for $30 per year, giving 20 boys beds large enough to return crops of approximately $4.00 each in value. Stockton, California, in a garden 60 x 150 feet with beds 3 x 12 feet for children of the first, second and

* Fertilizer provided by College of Agriculture. Many of the seeds are grown by the children.

third grades, estimates the cost at $37\frac{1}{2}$ cents per plot. A garden of an acre on the fertile soil of one of our rich western states, which required considerable grading and which paid its instructor $100 for the vacation work, furnished eight class plots and 90 individual ones at a cost of about $500 for the first year. Its little farms returned from $2.50 to $5.00 each. Another garden in the same state having 400 individual plots, 4 x 10 feet, and 25 class or sample plots, costs $475 per season, including its proportional part of the salary paid for a regular instructor in agriculture, and also gives from each little plot over $5.00 worth of vegetables. In the less fertile east, $650 covered the cost of 75 plots, 10 x 20 feet, yielding in the second year average crops of $4.00 value.

Here is a detailed estimate for the first year of a school garden, one section of which replaced a rubbish heap on an unsightly vacant lot in a good residential section of an Ohio town. The work required from the instructors was during the hours from 8 to 10 A. M.; and that from children in each division was two to four hours per week. A fee of 25 cents was charged each child. The work was started under the direction of a special teacher, assisted by the grade teachers. It was continued through vacation under the direction of the superintendent assisted by the janitor, and completed under the direction of the building principal. The garden was divided into four sections: East (individual beds 5 x 24 feet); West (7 x 23 feet);

North (7 x 45 feet.); South (9 x 42 feet). Of these, the East contained 14 plots, the West 12, the North 12, and the South 10, making a total of 48 beds. The average age of the children was eleven years. Premiums, known as the St. Clair prizes, were given. The net cost of the garden was as follows:

Plowing	$15.00	
Taxes or rental	30.00	
Seeds and plants	37.00	
Wear and tear on tools	5.00	(Estimated)
Incidentals, such as removal of trash	4.00	
	$91.00	

Deducting fees paid by the little gardeners, $11.75, made a net total of $79.25, or a cost per pupil of $1.65.*

* The average per garden, deducting the St. Clair prizes, was $55.05. The average for the pupils in vegetables raised was $4.64. The number of pupils raising less than $10 from the garden was nine. These results itemized are as follows:

		Vegetables sold	*St. Clair prizes*	*Vegetables used at home*	*Winter stored*
West Garden	$70.13	$44.66	$4.75	$14.75	$5.97
South Garden	86.29	69.49	9.25	5.10	2.45
East Garden	27.96	20.01	1.50	3.45	3.00
North Garden	63.81	39.34	10.00	5.91	8.56
Total	$248.19	..	..	..	..

This garden estimate omits salaries and the cost of tools and fertilizer. An estimate of the latter might be $1.50 per load in most places or 100 pounds commercial fertilizer per 100 plots 5 x 10 feet. In many cases street sweepings are furnished by the city.

Sometimes, some one interested in school gardens, having faith that a first year garden will establish itself as a precedent and win friends to support it with a salaried teacher in succeeding years, can be found to give his or her services as instructor for several days each week. Again, the salary can be divided among several communities, as is now done where a teacher of drawing, or manual training, takes charge of the work in a group of schools or in those of neighboring towns. Frequently, where school gardens are started in connection with schools, the question of salary is disposed of because the work is divided among the teachers. So, too, the need sometimes for a man's strength about the garden can be met by employing the janitor, or hiring a laborer, or utilizing the volunteer help of the larger boys instead of paying a gardener the average salary of $60 per month.

The question of salaries aside, the next most costly items are fencing, preparation of ground, and tools. Where it is necessary to guard against depredation, a fence of some sort, an *open* fence, is necessary. It should be open, whatever its material, so that the garden can easily be seen and may become an object of interest to the community. A hedge is preferable where it will serve, and is cheaper than an iron fence. While the hedge is growing, there may be guard rails to protect both it and the garden. If these are angular instead of flat or round, the hedge will be safer from the swinging feet or the falls of those

who might find the rail a good perch or resting place. There are many low priced wire fences on the market. The cheapest that I have seen and one that served well its purpose was a 5 foot woven



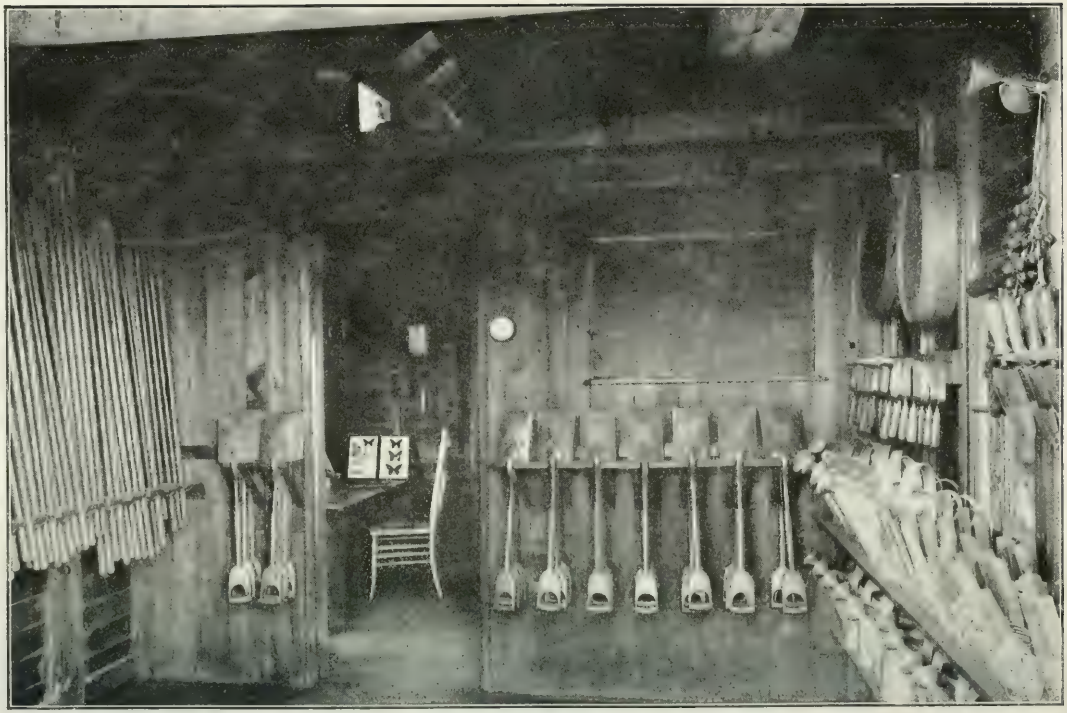
Fourth Grade Boys Fixing Fence, Normal School, Louisville, Ky.

wire fence (close mesh for a foot from the ground) stretched on round posts at the corners and gateway and on half sawed posts between. It cost 6 cents per running foot. This fence is not orna-

mental but it will last for a term of years and has the advantage that it can be set wholly or in part by boy labor. All wire fences when festooned with vines will lose much of their ugliness. A serviceable light iron fence or one with iron posts is desirable and is an excellent investment when the garden site is sure to be permanent. Where feasible, let the fence be low enough for the plants to be easily seen, or even have a top bar for people to comfortably lean upon while they watch the garden.

In regard to tools, in some localities children can be asked at a pinch to furnish them from the home supply, but this is usually unsatisfactory all round. Good tools are expensive, and they must be good whatever their size. For many gardens it is better to get what is known in the trade as ladies' size. They have shorter and slimmer handles which make them easier for the children to grasp. They are not altogether desirable where big boys are working large size plots, but for the average child from the sixth grade to the sixteenth year cultivating a plot from 4 x 8 feet to 10 x 60 feet or even 10 x 100 feet they will do admirably. There should be a few larger tools for general use.

The ideal outfit is a hoe, rake, weeder and line for each child, bearing his own number or name and having its own place in toolhouse or shed or nearby barn or cellar. (Every garden should have its toolhouse even if it be only a chest or box.) Hoe and rake should have five-foot handles



A MODEL TOOLHOUSE

which it is well to mark off by painted lines into feet of which the first shall be divided into halves and quarters.* A longer handle in unskilful hands is likely to ram one's neighbor. Children's tools, except for very little children (and then only if of good make), are valueless. Nor is the combination rake and hoe to be recommended except in handling very light soils. It is too liable to bend or break. Hoes of the heel shape or "half-moon" type are better because they lack sharp, straight edges; with them children are less likely to cut outlying roots or sprawling vines. Rakes should not be over a foot wide; better ten inches with eight or ten teeth so as to move easily between rows planted but a foot apart.

There is one rule which should be vigilantly and eternally and omnipresently enforced: *No child should be allowed to lay down hoe or rake except with its edges or teeth resting on the ground.* A first lesson in the handling of tools should enforce this rule. It should be shown how easily the handle of either, if accidentally stepped upon, when the tool is not face down to earth, springs up to strike any one nearby—and not always the careless person. It should also be drilled into the children that to step on the sharp edge of the hoe or teeth of the rake is often a painful thing if one wears shoes; that it is a dangerous and some-

* It is better to burn in the marks, which may be done by ringing them with several strands of string soaked in kerosene and setting them afire.

times a fatal thing if one is barefoot. One little gardener has paid for her carelessness with her life.

Weeders may be had at from 15 to 25 cents. The first are often of cast iron and apt to break. The small weeding forks are excellent and for little children on tiny plots are a sort of universal tool. Garden lines can be made by the boys. This set of tools, hoe, rake, line and weeder, will cost at retail from $1.00 to $1.25 for each child. One might also figure on a watering can (preferably with the long spout and rose spray*) for each 10 children where there are 50 or more working together, for all would not need to use them at the same time, and the garden hose could help out. Then, in addition, except for the grand days of preparation in the spring and fall (when more could be borrowed) only a few spades would be needed, one or two spading forks and shovels, an occasional wheelbarrow and a garden tape of steel. Other tools and the use of those mentioned may be considered later. After a garden is once equipped, the expense for repair of tools is slight, and both repair and methods of sharpening should be a part of the instruction among older children.

To make an estimate, the surest way is to figure on the cost apart from the instructor's salary. One might say, "I want so much money to start a garden, and also, if we have paid teachers, a reasonable salary such as any fairminded man or assembly of

* See illustration opposite page 231.

men and women would gladly give for good work." Workers differ, so does the amount of labor, as well as the knowledge required of them. Here is what one writer says of a supervisor:

"She should be a woman that is capable of supervising and directing the work of preparing the ground, laying out the plots and erecting buildings, as she will necessarily have to plan the laying out of the garden and direct both children and work. Some knowledge of surveying, plowing and drafting is indispensable. Upon the supervisor also falls the duty of engaging workers and the responsibilities of overseeing each step. She must make estimates and purchases of seeds and plants, and the whole government of the practical gardening is to be planned by her. In addition to this, she should give daily nature study talks which must be adapted to the varying ages of the children. As harvesting progresses, accurate records of produce per child, the attendance of said child, and the effect of work upon his physical, mental and moral being must be registered. All of these steps are worth while because gardening (in this country) is yet in its infancy, and because statistics must be obtained with which to convince those who are as yet unwilling to embrace the idea of its merit. Such individual records kept for 250 children to be afterward added, balanced, and the average found, more than fill the teacher's time during the hours in which the children are at school.

Many interruptions to this work occur, in the form of visiting classes, to which the supervisor explains the work of the garden. To have seeds planted and brought to maturity means an early start to the garden. The proper period for a garden is from May 15 to October 15 in latitudes from Washington to Maine. The work of the supervisor, however, begins the first of May or even in April, with the original planning and plotting and extends until about a week after the garden closes. It is only finished when a record of each day of the summer's work has been completed."*

Such a teacher may get $150 per month or more. She should get at least $125 and probably cannot be obtained for less than $100. If she has charge of a system of gardens, that is another matter. Such a one does not come under consideration in the cost of starting the first school garden in a locality.† Principals in charge of a garden or under a general supervisor, receive in one city $420, their work during April, May, June and September being from 9 to 12 and 2 to 5.30, while in July and August it is from 8 A. M. to 12.30 P. M. The season is from April 7 to October 7. Their assistants must be graduates of normal schools or colleges of good standing. They work from 3.30 to 5.30 during April, May, June and

* Bennett, H. C.: School Gardening in Great Cities.

† Supervisors of well organized systems of gardens receive from $1200 to $2000 for eight to ten months' service.

September, and from 8 to 12.30 during July and August, for $240 per season. Another city pays each principal $18 for a period (i. e. three hours' work) for five days each week during the season, and the assistants $12. In several cities, where few hours are required, a rate of 75 cents per hour is paid or from $2.25 to $4.00 per day. Assistant teachers for all-day work average $65 and $75 per month.

"The assistant teacher, as a rule, is needed only in the afternoons and on Saturdays during spring and fall when the children attend only after school hours; but during the vacation period, she may be needed for half the day or the entire day, according to the custom of keeping the garden open."*

Evidently the matter of salary is a local one, which each community must adjust to its own needs or purse. Similarly, the question of a gardener or laborer is local; undoubtedly there should be one or the other in every large garden.

"Trained teachers are more valuable than agriculturists without knowledge of pedagogical methods. Teachers not versed in agriculture may be supplemented by a gardener; if, however, teachers do understand gardening, a laborer may take the gardener's place. This man occupies

* An ideal ratio of assistants to children would be one for every seven or at most ten. Twenty or 25 children is the utmost that should be in any one class or division. England forbids her teachers in gardening to have more than 14 children in a class.

an important position in the work; he supplies the place of a janitor and assists the children in any work that is too heavy for them, such as working up earth with a pickaxe or managing a 50 foot hose. During the early summer and fall when the children are at school most of the day, he acts as a watchman; and during this time, when weeds grow rapidly and the children's hours of work are few, he also assists in keeping the garden clean."

Such a man may be a necessity or a luxury; if the first, count him in your estimate; if a luxury, count him out as far as possible and enlist in the service the helpful, knightly element in your big boys.

If the garden must be started on a small appropriation from the school or park officials or on voluntary subscriptions, and expenses must be cut down to the lowest sum, cut them down in a dignified way; no cut rates or wages, whether for laborer or teacher. Moreover, the reduction would probably have to come on the teacher's salary, because of a lack of appreciation of the required services, and because of union regulation of laborers' wages. "Anybody can dig in a garden" seems to be the popular sentiment. Anybody can dig, but anyone cannot grow plants, nor still more, develop children. No cut rates, but all the voluntary service—if of a good intelligent order—that can be secured. But let the matter be distinctly understood whether

the service is wholly a freewill offering or part is paid and the other given for love of the cause and faith in its demonstrable value. In many places, gardens must start with just such labor. Hence, the main purpose of this chapter is to try to show with how little a school garden can be started; how like the proverbial grain of mustard seed it is in its possibilities of growth and virtue.



Hazelwood Park School Garden, Pittsburgh, Pa.

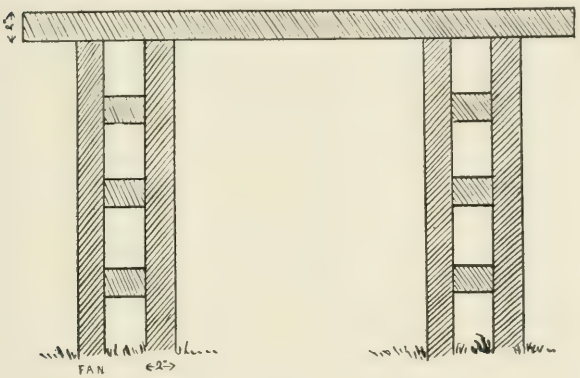
In computing the cost of a given garden, make a good, sound estimate, one that will cover all details and leave a margin for the unexpected; but if occasion requires, count in the least possible material as necessary, and count out all that could be arranged for, or for which substitution, however inexpensive or humble, could be made.

For example, land rental might not have to be considered or might be limited to paying taxes where outright loans of the ground could not be obtained. In some localities fertilizer, one of the big expenses, might be contributed by one or more persons as a gift or in preference to a cash contribution. A fence, that other considerable item, may already exist. There must be one. Without it, respect for property and honesty will be difficult to teach; impossible if outsiders become vandals. In a crowded city, in a tiny 15 x 8 foot garden, the boys made their own picket fence for the "Farmers' Club," so determined were those school children at least to make a beginning. If a fence already exists and is of solid boards, rip out some of them so that the public may feel that they are invited to watch the children.

Again with reference to expenses, the needed shelter and toolhouse* may be already provided.

* "One of the most useful accessories to the school garden is the garden shed, which is useful for storing tools and produce, and for carrying on work not suited to the classroom, such as preparing pickets and labels, analyzing soils, assorting seeds, arranging plants, etc. The average cost of the garden sheds (in Canada) is about $75. A popular plan is one 10 x 20 feet with an extension on one side about 5 feet wide, and finished as a greenhouse. This obviates the necessity of having special hot-beds. The garden tools are disposed along the walls of the shed in places numbered to accord with the numbering of the pupils' plots. Along one side of each shed is a bench or table of plain boards, about 18 inches wide, running close to the wall, along which are several small windows giving abundant light to pupils engaged in practical work."—Cowley, R. H.: The Macdonald School Gardens.

Moreover, a large piano box costing $1.00 can be made weatherproof and serviceable for the keeping of tools. A $25 tent can be made to take the place of the more costly portable house. A shelter from the hot sunshine may be a canopy of quickly growing vines.* If a tent is used, it must have a fly or it will be worse than a gridiron in hot weather, and give little protection in storms.



Section of Wooden Pergola

One can, perhaps, get along without a water supply, but sometimes a 4-inch hydrant and hose is almost a necessity. Then again, in many places the water supply is furnished. Tools can be lessened in number by giving different groups of children one kind of tool to use at a time, and ex-

* Posts driven into the ground and connected by wires to support quick growing vines will form the sides of a shelter that might have a double canvas and rainproof top.

changing for different ones as their need requires. There may also be some improvised substitutions. Children enjoy making things for real use. If some of the suggested substitutes seem inadequate, try them. Recall how much more enjoyment and benefit there is in the homemade toy or improvised tool provided it does its work well. Moreover, in several well known cases school gardens that nearly failed the first year, when too much of the preparatory work was done for the children, flourished the second year when the same children felt the gardens to be their very own because they had done all the work upon them that they possibly could. Here is another opportunity to lessen the expense of hired labor, particularly in clearing up.* A half dozen children by the use of ropes and crowbar, if wisely directed, can safely accomplish much clearing that might seem to require adult strength. Equipment can be divided into fundamental and accessory, limiting the latter according to the amount of nature study, housewifery and elementary science that is to be undertaken in connection with the garden. By substitution, also, one can lessen somewhat the cost of both the fundamental and accessory material.

Let us consider a garden for fifty children. In the first place, if one person is to supervise them,

* Sort the rubbish into piles of different materials. The stones and bricks and rocks may be handy for paving purposes; old wood for carpentry; old cans and bottles for plants and experiments.



See plan, page 148

DOAN SCHOOL GARDEN, CLEVELAND (Showing Central Arbor and Pergola)

the pupils should be divided into at least three sections for class or special work. As soon as convenient, they should be placed under some system of monitors or helpers or sub-instructors drawn from among themselves.* This will lighten the general daily work of the garden.

It may be well to insist that such discipline as is necessary should be almost military. The children like it better, provided the spirit is not that of the martinet, but one of mutual helpfulness expressed in firm, gentle, unyielding yet sympathetic manner. There should be no coddling, no pets, no excessive demands upon the child, no injustice through confusing the adult's and the child's point of view. There should be as little of the school atmosphere as possible, but prompt obedience coupled with the utmost possible liberty.

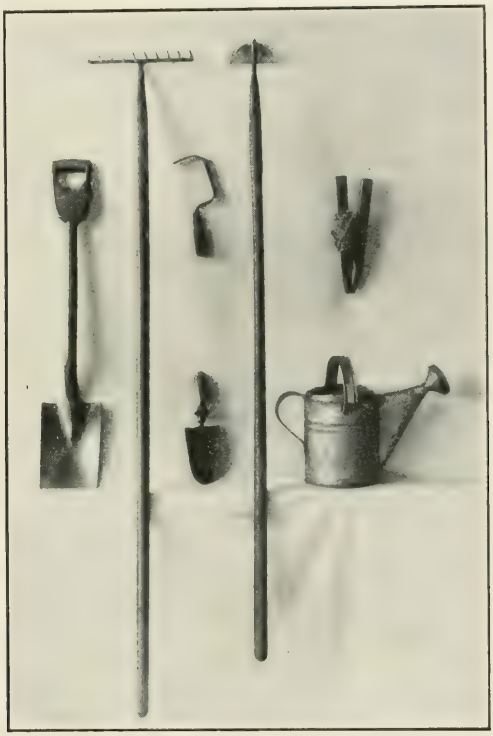
In a first-year garden the individual beds would probably be 4 x 8 feet or 5 x 10 feet, with none over 10 x 20 feet. An arrangement could be made to accommodate children of varying ages, and in the following year, the garden could be graded either from the standpoint of size of plot or from that of quantity or quality of work. The amount of fundamental equipment necessary would include first of all, spades, rakes, hoes, weeders, watering cans, and the few other tools already named. An estimate of cost of the most essential tools might read:

*See report of class secretary, page 45

1 dozen rakes (8 or 10 inches wide, to use easily between rows one foot apart, and with 8 or 10 teeth of strong malleable iron)	$4.80 per doz.
1 dozen hoes (Harper's half moon 4 or 5 inch blade)	4.75 " "
1 dozen weeders—at 25 cents each for substantial steel ones	2.50 " "
(weeding irons can be got at 15 cents each)	
3 watering cans—at $2.00 each	6.00
(Punch the rose holes outward to prevent clogging)	
3 spades with foot guards at $12 per doz.	3.00
Total	$21.05

Several of the best gardens allow 50 of the first three tools named to 300 boys (that is, one to six) and find them ample for daily use even where there is an excellent average attendance. This ratio of one to six gives a supply of 150 of these tools and there should be in addition some dozen spades, two dozen watering cans and a few other implements to draw upon. Another garden has 40 sets of tools with sometimes 60 boys present. Computing in the above ratios for the smaller garden of 50 children, would leave only about a tool apiece should every member be present at the same hour. But it gives a full set of three tools each to every child present, if the children be divided into work-

ing groups of twelve. Work can be arranged so that one group can use the weeder while another has the rake and still another the hoe. But for



Good Tools

comfort, the smaller garden would actually need a proportionately larger number of tools,* so that

* The Canadian estimate is "for each two children in average attendance, a rake, hoe, and hand weeder; for each six a spade or

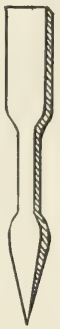
it would be better to spend more for these first tools, adding two spades, a half dozen each of rakes and hoes, and several weeders. To continue the estimate:

	Low Estimate	*Fuller Estimate*
For rakes, hoes, weeders	$21.05	$30.33
Wheelbarrow, Boys' size....	3.00	3.00
One steel tape, 75 ft.....	4.75	4.75
25 feet rubber hose.....	3.00	3.50
50 note books at 2 cents each	1.00	1.00
Flag, rollbook, blackboard, hammer, saw, nails, sundries.....	10.00	10.00
50 membership cards.....	1.50	1.50
Stake and labels	2.00	2.00
3 forks, ½ dozen trowels, which are $5.00 a doz...	5.50	5.50
Seeds and plants.....	20.00	25.00
Cord, raffia, etc. (cotton awning line costs 30 cents per lb. 10 lbs. will make 50 garden lines).....	3.00	3.00
	74.80	89.58

To these must be added as accessory expense at least $5.00 for pans, glass, paper mounts, pins, etc. if any experimental work or insect work is

fork;" and two shovels, three transplanting trowels, 100 foot line and reel, 166 foot tape line, a wheelbarrow and lawn mower, would make the cost of tools for a group of thirty children where they work two on a plot (senior and junior) about $30. Cost of seeds about $4. For quantity, see Appendix A, Note 8.

to be undertaken. Further accessory equipment may be obtained by having homemade trellises, root cages, racks for soil testing, flats, homemade barometer, rain gauge, sand boxes for planting (or for the entertainment of the tiny child visitors whom the older "little mothers" sometimes have to bring), rubbish boxes, bed markers, butterfly nets, and numerous other substitutes that save expense.



Cultivating Stick

With small children, in their first year work, or on plots not over 8 x 10 feet, the weeders (also the hoe and rake) can be supplanted in part, or wholly, by the cultivating stick. In the remote districts of Italy, a plow is still frequently only a tough forked limb of a tree pushed or pulled through the ground. A cultivating stick is merely a piece of soft wood, or lath, one-fourth of an inch thick, one and a half inches wide, and 12 inches long, shaped to the hand and pointed at one end, which may be hardened by charring it. Held in the hand like a dagger and thrust into the dry, hard earth until the fingers strike the soil, it cuts each stroke to a uniform depth of between two and three inches and leaves in its wake a fine mulch.* In untrained hands, it is less likely than hoe or weeder to cut or damage

* For this useful substitute, I am indebted to Mr. Henry G. Parsons.

the plants, and it is as effective as either in loosening the soil and uprooting the weeds. The child at the end of the short cultivating stick is much nearer to the ground than when using the long-handled tool. He can and will at close range take far more interest in noticing color and form and the differences in both whether in weeds or in plants; for example, the similarities and dissimilarities between the weed purslane and its cousin the flowering portulaca; between the grass blade and the blade of corn; between the redweed and the tiny seedlings of the beet.

The wheelbarrow is for general and large use. For daily weeding in the individual plot, each child, or every two children, may have a basket, or better, a small wooden box (or a soap box cut in two) with hoop handles attached. In this they should carry the weeds from their gardens to the compost heap. In large gardens where the paths are wide enough, children may be taught to bury the weeds, but this custom is better among the older children. The buried weed helps to fill up hollows and supplies humus to the soil when, in the future, paths and plots change places in an occasional rearrangement of the garden.

From lathing can be made large labels, stakes, plot markers, root cages and racks. Two cultivating sticks can be made for each child, one bearing his name or plot number to stand at the head of his bed when not otherwise needed.

The other, similarly marked, with a hole bored in it, is used to wind the garden line upon, and when not in use should hang in the toolhouse. When the line is used its loose end can be quickly tied to the other cultivating stick. Lines are best made of four-strand braided twine, and should be long enough to go easily around the child's entire plot.* They should not be left out in the weather to rot.

A saving can be made in the matter of seeds, by getting them from the government and by buying penny packets for very small areas. For larger plots, buy in larger quantities and put them up in packets holding enough for each child. Compute much more closely than the seedsmen do for general gardening. Seedsmen sell a "nest" of seed measures, but one can calculate the quantity to use by the length of row and distance apart, allowing some margin. A test tube with an elastic band to mark the amount of seed needed can be employed after the amount is learned.

In transplanting, trowels will be found convenient. Dibbles can be homemade from an old broom or tool handle. Fork and shovel are occasionally great conveniences even in a small garden. A hand plow is a luxury. One with several attachments, such as rake and weeder, can be had for from $3.25 up to $7.00 according

* This twine can be bought in balls. If each child is thus provided, only a few of the longer, more expensive garden lines will be needed.

to the number of parts. Number all tools so as to keep track of them and of the care the children give them.

In regard to care of tools, every one should be returned to the toolhouse dry and clean. The loose dirt should be wiped off with an old cloth, or better, with a strong brush such as plumbers use. Every particle of dirt between the tines of a fork, the teeth of a rake, along the grooves on the back of the spade, as well as on the handles should be removed. In the fall, before putting them away, any rust should be cleaned off with emery, all handles oiled, and iron parts thoroughly wiped with a cloth smeared with tallow. The tools should then be put away in a dry place for the winter. Linseed oil on handles keeps them moisture proof and smooth so that they will not dry out and splinter. The tallow prevents rusting of the metal parts.

The illustration opposite page 171 shows the position of the rake in use. Such grasp of the tool calls into play the most strength with the least effort and avoids fatigue. In hoeing, the unloosened ground should be attacked from the edge nearest the worker, who should stand in the path. The reason for this is that in so working each stroke cuts a clear, clean slice off the ground in front of the worker leaving a clearly defined line between the soft earth that has been hoed and the hard, unloosened soil. Then there is no danger of skipping parts of the ground as there is

when hoeing from the center of a bed towards one's self; unhoed portions are frequently covered by the forward pull of the loosened earth.

In any kind of garden, beds are seldom over 10 feet wide, a measure that gives an adult an easy reach in hoeing from either edge to the center and in raking from the center to the edge. This avoids stepping into the bed or upon the loose earth. (Where much hand weeding has to be done, six feet in width is better.) There should be no trampling of spaded earth or mulch. Raking should break the coarser lumps and leave an even, level surface. If necessary, trampling must be avoided by spading or hoeing in sections of a width within easy arm's reach. Follow this by raking the same area and, that section completed, a new one may be begun. In all three operations, hoeing, raking, spading, the work should be done in straight, even lines so that if obliged to leave it suddenly, it will be completed up to the point where left and present a tidy, finished appearance. Section work gives an opportunity for division of labor among groups of children using different tools. Let one gang under their appointed or chosen leader follow the other, as in clearing a lot, spading and raking it.

Spading should be done properly. It then cannot harm, and will delight, the children. Even the smaller ones should be allowed just a few moments of it. But care must be exercised to see that children do not reach the fatigue point

and that they use both the tool and their muscles properly. The strong, shallow spade is not a crowbar to pry with nor is it a shovel which is made to lift earth from place to place. The spade is to loosen relatively soft earth and to turn it over. To use the spade, start with one hand grasping the top of the handle, the opposite foot



Proper Use of the Spade

on the blade, and the other hand holding the handle a fifth of the way down. The weight of the body should be used to drive the blade its full length into the earth; the hand should be slid down nearly to the blade as you lift and with a light toss ahead completely turn over each spadeful of soil. When returning the spade for the

next cut, strike lightly with its back the lumps of earth just turned as they are falling to the ground. Straighten the back between each spading and rest a moment. The brief rest saves the stooped back, and avoids the quick oncoming of fatigue. In the work of lifting, depend upon the muscles of the back and legs, feeling the tension to the toes and lifting, as it were, by that. If the blade be turned very slightly when inserted in the earth, the side edge will act as a wedge and carry it in more readily. If hardened earth or a stone be met, moving the spade gently back and forth will give a better purchase and enough leverage to dislodge fair-sized stones. (Later, the principles of the lever may be illustrated and the reasons for so applying muscular strength.) Spading and raking as well as ploughing and harrowing if properly and thoroughly done are really more beneficial for many soils than the application of fertilizers.

In using the wheelbarrow, demonstrate that the load piled well to the back is the easier to trundle; also the respective values of the grip close to the barrow and of that nearer to the end of the handles. A substitute for the wheelbarrow is the improvised litter carried between two children, or they may play they are Indians with the savage drag made of crossed poles tied together.

To sum up: To make an accurate garden estimate, or even an approximate one, all conditions must be known. One way to go about it would be

to make a list of things that must be done and must be had; then to decide how each is to be obtained and estimate the total cost. The list would include:

A teacher, salaried or unsalaried.

Cost of rental of ground.

Preparation of ground, including labor and fertilizer.

Tools as per estimate.

Flag, roll-book, blackboard or blackboard-roll (to be hung to post or tree).

Shelter for tools.

Shelter for children. (?)

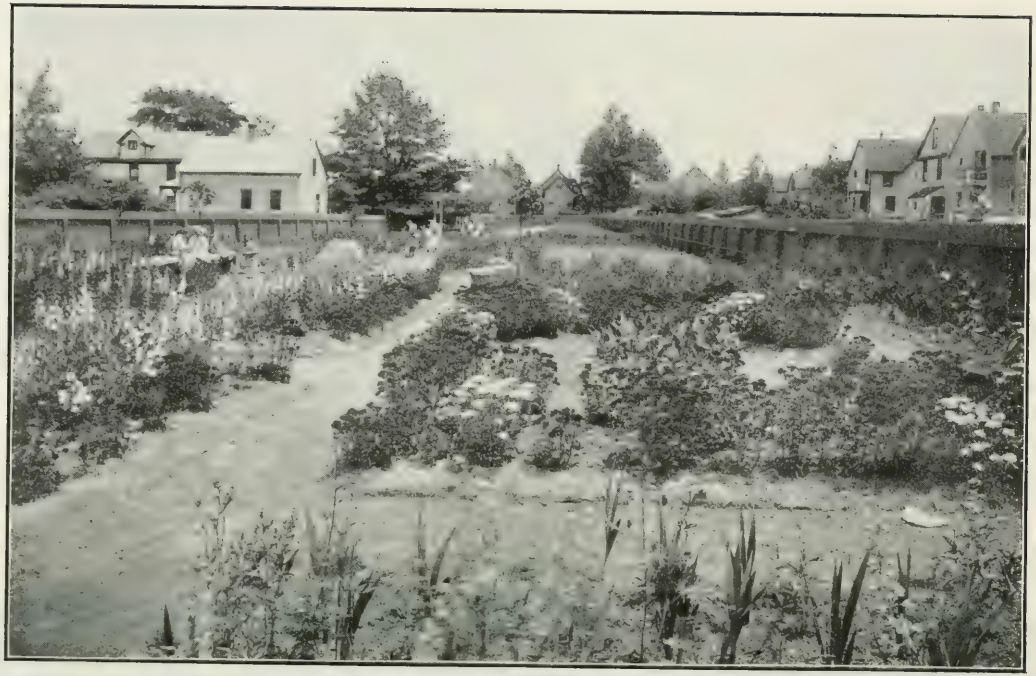
Seeds and plants.

Water supply.

Sundries, including a few carpenter's tools, as saws, hammer, whetstone, nails, etc., and a small "first aid to the injured" box to treat accidental cuts or hurts which, however, rarely occur.

CHAPTER V

PLANNING AND PLANTING THE GARDEN



ROSEDALE GARDEN, CLEVELAND, OHIO

The Rosedale garden as planned is one of the finest examples of the possibilities of this department of work in the United States. This garden is separated from the children's playground by a broad line of small boulders that are covered with roses and vines. A sun dial on a granite boulder and two curved stone seats separate Section I, the Formal Garden, from Section II, the Children's Garden, which merges into Section III, the Botanical Garden, arranged by families.

CHAPTER V

PLANNING AND PLANTING THE GARDEN

"Begin early, early enough to stir up enthusiasm before it is time to stir up the soil."

"With hand on the spade and heart in the sky, dress the ground and till it."

TO get the best effect of light and to avoid shadows upon the plants, buildings should be placed at the west end, or occasionally at the extreme east if the garden is a part of a park or playground. If this be done, the sun from April to October, after 8 A. M., will strike the plots. The afternoon sun is less scorching and, in foggy regions, the western sunlight is the more important. Consequently, no large trees should be to the west or south of a garden; they should be to the north or east. Where a garden adjoins or is part of a park, if the larger paths are left as broad strips of turf the effect is much more beautiful.

To give crops a good early start, it is desirable that the garden should be on a sunny slope to the south, for such a location will have the advantage over others of giving some 40 per cent more light and warmth. If possible, let the location be

decided upon in the fall so that the soil may be examined and carefully prepared for use in the spring. The ground should be fairly even, so that the slope of the lay-out may be either all one way or from one or two central lines or ridges only, as from the top to the bottom, or center to the sides of the garden. Such an arrangement would usually settle the question of surface drainage by the slope and crowning of the paths. If, however, the ground is markedly uneven, it is important to have a system of paths and beds that shall drain it well. If the soil be wet and heavy, it may even be necessary to introduce tiny ditches. If the region be one of scant or infrequent rainfall, irrigation ditches must be considered. Still, a unity of plan must be kept throughout, and the laying out of both paths and plots subordinated to it. It is impossible to give specific directions for every site. Various plans must be studied for the arrangement of the garden, for its shelter or arbor, its toolhouse and other buildings. Only general suggestions are possible.

A garden should have a name. Bird-houses add a pretty feature, and special guide posts or signs interest the children. Sometimes they like to name the paths and the summer house. Fences, arbors, even trellises for small plants, are best painted green. (It is worth while to buy the very best green paint.) This color wears well and harmonizes with nature's coloring.

A garden plan must provide easy entrance and

exit. Nearly all designs show some central place for observation of the work carried on in all parts of the garden. This may be either the center of the garden itself for pergola, arbor or shelter, or else some commanding point from which a view of the whole may be had. From such, the plots are laid out in straight lines giving rise to larger

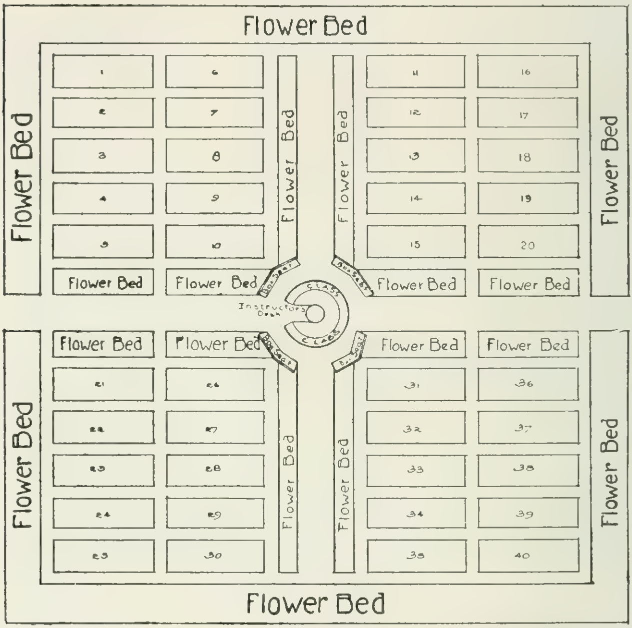


Courtesy of National Association of Audubon Societies

A Garden Should have a Bird-box

squares or rectangles, or they may be made to radiate from the center. Rectangular plots are preferable to round ones, as they can be worked more easily from the paths; also because they more readily become component units of a whole. Farmers' Bulletin No. 218 approves a garden plot 5 x 16 feet as most readily worked without need

or danger of tramping down the bed. Except in "training gardens" or where there is a graded course of work, children's plots are seldom larger



See opposite page 131

PLAN OF DOAN SCHOOL GARDEN (SHOWING TEACHER'S TABLE AND CLASS BENCH)

than this, and 4 x 8 feet or 8 x 10 feet is the more frequent size.*

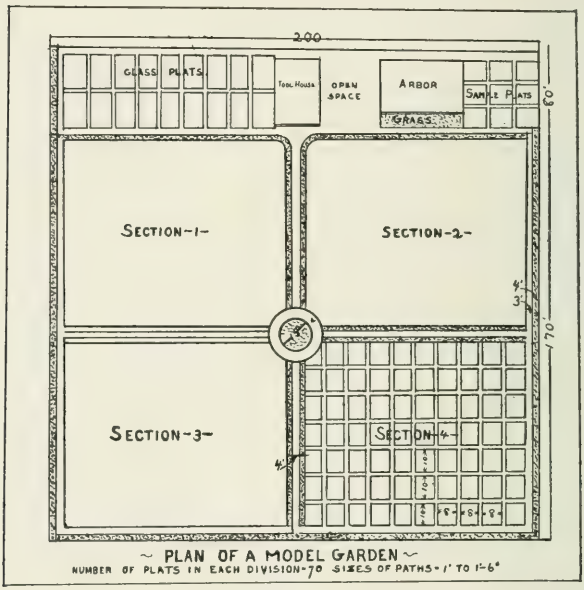
* Experienced teachers maintain that children under fourteen should not have plots over 10 x 15 feet. Small beds tend to waste space by requiring many paths. Dividing a garden into spaces of 5 or 10 feet is frequently easier and, by giving a decimal unit, makes many problems less troublesome for the children to compute.

Assuming the ground to have been cleared, plowed and harrowed, or spaded and raked *for* or *by* these would-be farmers, the teacher should calculate its area, study its possibilities from the aesthetic point of view, and roughly map out her plan. Beginning at the center of the plot or the central point, she should lay out a bed for flowers, or a space sufficient to build the small arbor, pergola or shelter which is to have vines trained and flowers arranged about it. Such shelter might have a circular seat and table to convert it at will into a small classroom for talks or experiments. It will also provide a reception or resting room for visitors to the garden who wish to watch the children or to hear about their work. From this point the main paths 3 to 4 feet wide should extend or should radiate north and south, east and west, and these should be cut by narrower paths running at right angles. These main paths must make every part of the garden easily accessible from the entrance. The lesser paths should be from 1 to 1½ feet wide. If the grounds are very large, the few main paths may be 5 feet, those separating sections of the garden 3 feet wide.*

For convenience let us assume that we wish the center of the garden to be also the center of work and interest. To plot the garden, find its

* Paths 1 foot wide between the individual beds give a more businesslike look which the children prefer, for they enjoy doing things as "grown up farmers" would.

center, and stretch two garden lines across the whole length due north and south, and two in like manner east and west. Keep these lines always the exact width of the proposed paths apart, say 3 feet. Lay out the central flower bed, or the outlook, with the center of its



base corresponding to the central point of intersection of these two outlined paths. Then, first on one side and then on the other of each pair of these stretched lines, with the steel garden tape, lay out points corresponding to the width or length of the proposed small gardens, or the



KINDERGARTEN CLASS, CARROLL GARDEN, PHILADELPHIA. (Castor Beans Shielding an Ash Pile)

group gardens if they are to be for children working in groups only. But if the little gardens, for instance, were 5 x 8 feet with their rows running north and south so that the moving sun may distribute heat and light more evenly on the crops than if they were planted from east to west, the points marked off would run along the north and south lines at 8 feet, 3 feet (for path), 8 feet, 3 feet, and so on; and in the east and west directions, at 5 feet, 3 feet, 5 feet, 3 feet, and so on. Mark these points with stakes. These must be carefully set so that each measure of bed or path shall be the exact measure from the outside edge of one stake to the outside edge of the other. From the first, stress must be laid upon this exactness of measure, else the few inches in the width or even the edge of the stake, will throw them, as well as the adult who originally lays out the garden, into confusion, and create irregular, uneven, undesirable lines which will destroy all the symmetry the completed picture should silently and constantly teach.

The actual making of both the paths and the beds may be left to the children. The smaller paths should be staked out. In doing this, stake all those in one direction and then those at right angles. The individual beds to the required number should be set off and numbered plainly by a stake at the center of each plot, facing the head of the garden. A few individual plots may be reserved for the "waiting list," but only a few so as to keep the children keenly eager for them. The

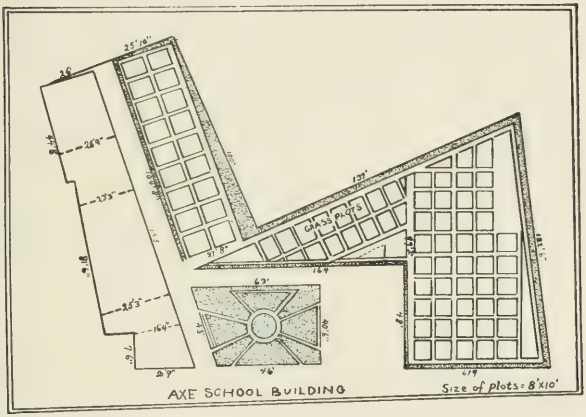
remaining beds should be planned both as to location and size, with reference to observation work* and decorative effect. Space must be allowed for a compost heap to be screened by high grasses, grains, or flowers; also for cold frames, if any; for the "weed garden"; and if wise, for both a "model plot," where the planting lesson is illustrated and the "supply plot" from which seedlings may be taken to make good in the children's rows deficiencies for which they are not to blame. Finally, all the measurements should be checked off by the steel tape to ensure absolute correctness. The work may be expedited by an eight-foot strip of wood which can be slipped along the ground beneath the extended lines, while stakes are driven in at the required distances.† (Such a board 8 to 10 feet long, another 4 to 8 feet, and another just 2 feet long, marked in feet and half feet, will be found very convenient for garden measurements in planting, transplanting, straightening, bounding edges, paths, and for many other purposes.) The advantage of plots laid out from the center of a garden is that any irregular strips of land will be left at the sides and ends where they may be used as sample plots, or to give a finish, as of a rich frame of flowers

* See Appendix A, Note 9.

† Particularly in kindergarten work when the board may be made to mark a furrow with its main edge. It may be laid for the children to stand on while planting; and to firm the seeds by using it to tramp them down after they are covered.

to the central part. This framing should be emphasized by a path at least three feet wide separating the border from the main part of the garden. In the work of laying out the garden, all the measurements should be made by one person or by one person with a helper.

The next step in planting a garden will be to



Plan of Axe School Garden, Philadelphia

draw it, when thus outlined, to careful scale, and to make a careful selection of the plants, flowers and vegetables desired. Such a design may be made in water color or crayon, to get the general effect of the contemplated arrangement.

First and foremost, remember to grow only easy, familiar things. Do not try novelties. You want your plants to come up. You want them robust enough to endure varied weather and child

farming. A list of the flowers that are pretty sure to grow, includes the following:

Aquilegia.
Asters.
Bachelor Buttons.
Balsam.
Calendula, or Marigold.
California Poppy.
Candytuft.
Celosia or Cockscomb.
Cosmos.
Dahlia.
Delphinium or Larkspur.
Digitalis or Foxglove.
Dianthus (hardy pinks).
English Daisy.
Four-o'clock.
Gaillardia.
Helianthus or Sunflower.
Mignonette.
Morning Glory.
Myosotis or Forget-me-not.
Nasturtium.
Nicotiana.
Pansy.
Petunia.
Phlox.
Pinks.
Poppy.
Portulaca.
Pyrethrum.
Ricinus (or Castor bean).
Snapdragon.
Sweet Alyssum.
Sweet peas.
Verbena.
Zinnia.

To secure a continuous bloom from June to frost, one may select the following, being careful to allow no seed pods to form:

White: Cosmos, aster, verbena.
Pink: Aster, carnation, cornflower, cosmos, dahlia, gladiolus, sweet peas, sweet sultan, verbena.
Blue and Purple: Aster, cornflower, heliotrope, sweet pea, verbena.
Red: Carnation, cosmos, dahlia, gladiolus, nasturtium, sweet peas, scabiosa, verbena.

Yellow: Calliopsis, single dahlia, nasturtiums, marigold.
Neutral: Mignonette.*

For high planting one might suggest: castor bean, golden glow, goldenrod, wild purple aster (tall), wild sunflower, all good to hide locations of spent hot beds or cold frames, compost piles or other undesirable sights.

Of vegetables, it is customary to grow lettuce, radish, beans, beets, carrots, onions. Corn may be grown even in very small plots where there can be only from one to three stalks. Where there is more space, one or two flowers should be added (usually as a border at one end or all around the little plot). If the plots are from 8 to 10 feet or larger, such vegetables as Swiss chard, peas, cabbage, one or two hills of squash or cucumber, potatoes, and rows of corn may be selected. Sometimes a choice of seeds is permitted, but for the first year's work, particularly on very small plots, it is better to have the crop uniform or nearly so. The purpose in the selection of the seeds covers utility, ease of cultivation, and typical plant form, and in the planting, provides lessons in soil and plant economy. As said, rows preferably should run north and south. If they run east and west, the taller plants must be on the north side so as not to cast

* For simple cultural directions for these and many others see U. S. Department of Agriculture, Farmers' Bulletin No. 195. Annual Flowering Plants. It is illustrated, and sent free.

their shadow on the other plants, and the paths between the plots should be much wider, so that one garden may not overshadow another. Of course, with low crops the width of the path need not be so great as where high corn, grain, or even things no taller than tomatoes, are grown. Observation plots having tall plants may be arranged, for æsthetic reasons, against a high wall or fence.

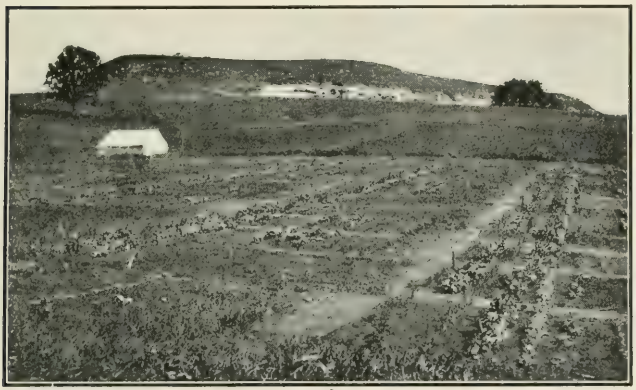


Lines Stretched for Planting. Red Wing, Minn.

If there are round beds, tall things should be planted in the center. Straight lined beds are less likely to have edges trodden or be worked irregularly.

The list of seven vegetables, radish, lettuce, beans, beets, carrots, onions, corn, to begin with, contains more than one word that makes the mouth water with pleasurable anticipation, and

causes young eyes to shine with the thought of prospective ownership. From the teacher's standpoint, these vegetables are typical and full of material for all sorts of lessons. Corn is typical of the grasses and grains and illustrates wind pollination. Its first tiny upreared blade warns the teacher that it is time to have the children definitely observe and tell her the resemblance



Crops Appearing. Red Wing, Minn.

and the differences between the blade of grass and that of corn. From this time on until the ear matures, or even until the use of the old stalk can be explained, there is opportunity for daily observation.

But the corn must have only its fair share of attention. The feathery threads of carrot leaves differ from the hooked, needle-like stems of the

plot, will show that, like the daisy, it is one of the compositæ. It will also furnish practice in transplanting. No plant shows better the sickness and ill health resulting from overcrowding or loss of sunshine; perhaps none offers better lessons in the hygiene of plants, especially young ones. By unerring analogy, it shows why pale faced, weakly children come from crowded, squalid sections of our city, and how much good air, good food (for lettuce needs rich soil), and good sunshine mean.

In purchasing seed, care should be taken to consult local conditions and the time limit of the proposed garden, so as to select varieties that will come to maturity sufficiently early. The child wants a plant that shows off well rather than one of particularly fine flavor. Other considerations that might influence choice, particularly in the observation plots, would be whether crops were grown for the child's interest alone, or with a view to furnishing special material for nature study or drawing in the schools. A six weeks' garden is about the shortest growing time allowance, and for such in the latitude of New York, on a good soil, the following seeds were chosen:

	Mature in:
Radishes (Scarlet Globe)	17 to 25 days
Beans (Refugee, Thousand and One)	50 " 65 "
Beets (Detroit Dark Red)	70 " 90 "
Turnips (White Strap Leaf)	70 " 90 "

baby onions. They represent two families. The carrot, like the parsley with its umbelliferous flower, belongs to the umbelliferæ or parsley family; the onion, to the lily family. The radish has seedling and later leaves of quite different form, and as the children grow it, its family relationship to the cabbage, cauliflower and brussels sprouts would not appear. Let a few of each run to seed so as to bring out the resemblance. The carmine of one side of the stripling beet leaf likens it to, yet separates it from, the useless redweed. It will take two years to complete the life story of the beet.* All five are root crops of one sort or another,—while one among them is "good at both ends to eat." The tender leaves of the young beet plant are excellent for greens.

Beans are a type of the wide spread leguminosæ, though very different in their germination from the pea of the same family. They both show the root nodules where dwell the nitrogen-fixing bacteria. The way the beans push up, and the explanation of the fat store of food in them, make a delightful story of the feeding of the young plant. They offer, also, lessons and experiments showing the great force of swelling bud and bursting pod, of things pushing toward the light,—even of trees and plantlets splitting the rocks. Beans show self-fertilization.

Lettuce, if allowed to flower in an observation

* Have a sample plot of sugar beets and of the brilliant foliage beets.

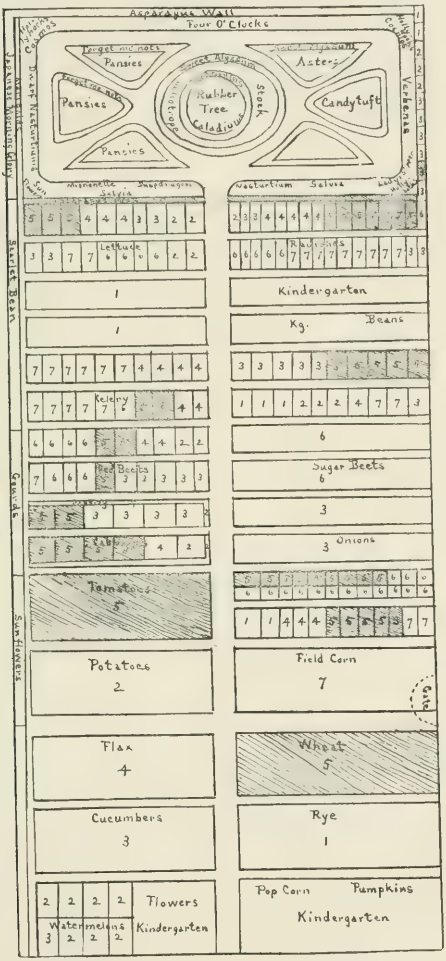
Mature in:

Carrots (Early French Forcing).....80 days, edible in 60
Onions (White Portugal) pull any time.
Lettuce (Black seeded).....42 to 50 days
Corn (Early Corn).....60 " 70 " *

A better selection could have been made had there been more time for them to mature, yet all except the corn (which will set in the ear), and possibly the beans, furnish some harvest, even if not full grown or complete. Consultation with a skilful local gardener, or a note accompanying a tentative order to a well established seed house, will solve doubts as to what variety of seed to plant. If the local seed dealers buy of reputable wholesalers, it is well to enlist their interest in the school garden, assuring them for example that so old a house as James Vick's Sons thinks children's gardens worth a special department wherein the penny packet figures; and that the general testimony throughout the country is that, where school gardens have sprung up, there is an increasingly larger sale for flower and vegetable seeds.

Before planting, the teacher should test the percentage of seed fertility by germinating 50 or 100 seeds of each variety (see footnote, p. 184),

* Crops as planted at DeWitt Clinton Park, New York City, and by the normal class in school gardening under Mr. Henry G. Parsons at the University of New York, University Heights, Season of July 2–Aug. 11, 1908.



GARDEN OF FRANCIS W. PARKER SCHOOL, CHICAGO

carefully noting results and percentage of germination. Seeds should be clean, bright, plump, and range from 85 to 90 per cent in fertility.

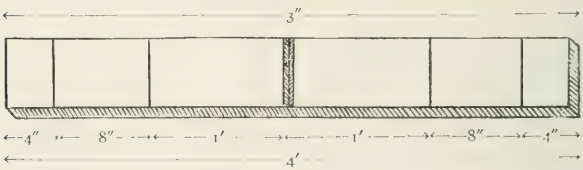
In distributing seeds for planting, they may be given out in envelopes or poured into the child's hand when he is ready to drop them into the ground. If the first method is used the envelopes should be distinctly stamped with name of seed, and perhaps in addition, with a brief cultural direction as to the depth of planting and distance apart.* For marking such envelopes a rubber stamp or alphabet costing about 75 cents will be found very useful. In some gardens the lesson of the day is written on the blackboard to be copied by the children into a class book, and the seeds in envelopes are given them as they pass to the garden. The books are left in the classroom. Some few boys copy planting directions on slips which they take with them; others depend upon comparing memory notes, watching others or asking the teacher. With third or fourth year boys in graded training, or older pupils, this method of blackboard lessons may be good, but with little folks it seems a weary effort and lost labor. For them a diary of what they do and what they see, kept as they choose, long or short, written or drawn (provided they keep it with a fair degree of neatness), is greatly to be preferred.

* Planting tables give the usual depth. See Appendix A, Note 10. Very wet weather decreases and very dry weather increases it by about half the depth of normal planting.

There are other preliminaries to "planting day" besides the planning of the garden. Children may be registered before the first planting lesson,—and should be if the teaching force is short-handed. Early in the season, notice should be given the school children so that they may apply for gardens. Out of such applications fifty, or the number desired, may be selected and others placed upon a waiting list. If there is a sufficient appropriation, membership cards may be issued, and later, some form of badge or certificate of membership or merit. The cheapest way is to notify the children by postal that they are to appear for registration at the garden the day before it opens for classes. At that hour they can be marched about the garden, shown the toolhouse, allowed to get a general idea of the premises, and may be told a little about the work to begin next day. Then, one by one, they can be registered in the class book under nationality, school, age and home address. To each must be given some badge or card of membership. Denison express tags with name on one side and the above specifications on the back may be used. Make the children understand that the tag or badge, and that only, carries the right to work in the garden, and to ownership of the allotted plot. If lost, it will not be replaced; if transferred, it will probably be forfeited, and the garden given over to some one on the waiting-list. The children will probably tie the tags around their necks. These tags may also

bear a class or division number to help the child remember at what hour he must appear for instruction, though he may come at any of several allotted periods for the general care of the garden.

The children are now ready to begin business on planting day, and, if one has to manage many of them, this preliminary work will prove a great help. When they arrive for the lesson, select one or two children in each division to help you if you should need any assistance. To help them, you should have all tools and seeds ready, and for



Bed Marker, or Marking Board

first year *first day's work*, you would do better to have the furrows indicated at both ends of the beds. (This is quickly done with a marking board.*) Planting by the line might better come later. It can, however, be introduced on beds 8 x 10 feet and over, by stretching the lines across the initial markings which will help to determine them. Thus you will avoid, on the very first planting day, the delay and confusion likely to

* See photograph and drawing. A board 1 foot wide, 4 feet long, beveled strips of wood nailed at distances indicated. For convenience it may have a long handle attached as the boy has made it.

SOME FORMS OF REGISTRATION

No. FAIRVIEW GARDEN SCHOOL.
Register Card.
Fill out and Return This Card to Office.

What is Your Name.....
How Old are You.....
What School do You Attend.....
What Grade are You in.....
Where do You Live.....
Have You Ever Been a Member of the Garden School Before.....

A. Application for a Garden

THE FAIRVIEW GARDEN SCHOOL
Fairview Street and Ridge Avenue, Yonkers, N. Y.

Membership Ticket.
Season of 1909. Garden No.....
Name.....
Bring this ticket with you when you pay your dues.
Edw. Mahoney, Superintendent.

B. Membership Ticket

Record of Payments.

Dues	cts. per week.		Garden No.	
April 24	May 1	May 8	May 15	May 22
May 29	June 5	June 12	June 19	June 26
July 3	July 10	July 17	July 24	July 31
Aug. 7	Aug. 14	Aug. 21	Aug. 28	Sept. 4
Sept. 11	Sept. 18	Sept. 25	Oct. 2	Oct. 9

Remarks:

C. Reverse of B

occur when eager children rush to possess their farms or first begin to make practical application of figures and measurements. If there must be a large amount of planting in a limited time, the



Eight-year-old Boy Who Made His Own Marker

long garden line can be stretched across a section of individual plots and the children may use it as a guide for the complete planting of one kind of seed; then, moving it for the next furrow, plant

the second row of seed and so on. Lines of planting should be even and continuous. The rows, though broken by paths, should run way across the garden, both for æsthetic reasons and for easy comparison of individual plots.

The question arises, shall all the planting be done at once? If there are large areas to plant, or the children come every day, it may be divided; but if they come only once or twice a week, the sooner the seeds are in, the safer and better, and the less likelihood of the work dropping behind and of consequent discouragement. If possible, finish the planting the first day. In all small plots this can usually be done. By working diligently, three-quarters of an hour or less even is sufficient to plant a 4 x 8 foot plot with seven vegetables.

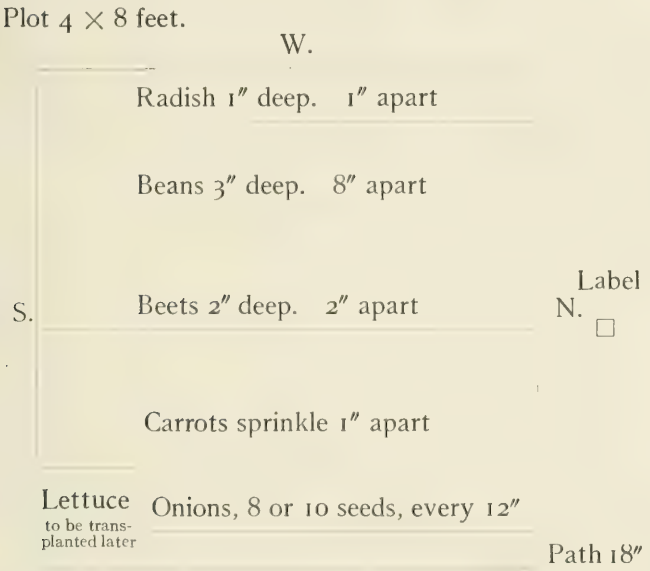
The work of the first day should consist of an object lesson in planting in a model bed, given by the teacher, with the class at attention in an open square about her.* An hour's instruction in the garden including this lesson is long enough for the first work with little people. The teacher should do exactly what she wishes the children to repeat and should accompany the action with a brief, clear story of what she is about. When she has finished, the children should march directly to their own section of the garden and scatter to the beds bearing numbers corresponding to those

* This lesson may be given indoors by using a small box of earth to represent the plot, but it is better given outside.

upon their cards. They should take their places, all standing on the same side of their respective plots. On the first day, it is better for them to find their tools in the middle of each plot. At word or signal of command, they should take up the hoe, and with it mark their first furrow, as they have seen their teacher do. Then they should stand at attention and await the order to make the next furrow a foot to the left or to the right at the required depth, unless they have the seed for the first furrow and are told to place it. Usually it is best for the teacher to inspect each step of the work, the placing of the seed, its covering and firming with the back of the hoe, and to do this in the case of each variety of seed planted. One span of the child's hand may be counted at four inches as a measure in planting. The seed may be distributed from bottles, any number of which, for convenience, may be placed in a box or basket. Collect all seeds which the children do not use and return them to the bottles. In larger plots, each row of seed should carry a label bearing date of planting and name of seed.

When the planting is completed, a 4 x 8 foot plot will require 8 full measures of a 6-quart watering can, or 48 quarts of water to 32 square feet of ground. If the children are to have the fun of watering, a water line should be formed to preserve order. The one all important rule in watering is to soak the ground to at least the depth of four inches, and to water infrequently,

perhaps only once a week. A little water only helps to start evaporation and consequent loss of ground moisture by capillarity and is worse than none. If there is to be a water supply, try to locate it centrally and have a basin of stone work,



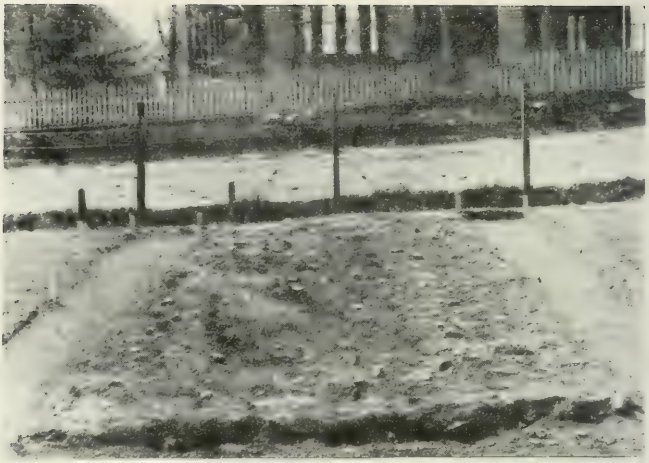
PLAN OF PLANTING USED BY TEACHERS' CLASS, HENRY G. PARSONS, INSTRUCTOR,
New York University, Summer of 1908

however amateurish, to catch the spilled water and soak it up so as to prevent wet feet and puddles. A 4-inch hydrant will furnish good working force, if fitted with two or more cocks for inch or two-inch hose. The hose itself had best be one-

inch pipe because it will be 7 pounds lighter for each 25-foot section than the usual $1\frac{3}{4}$ inch piping. It will wear out less quickly from being dragged about, and the children are less likely to do damage with the smaller stream.

A general rule for planting flower seeds is to scatter very fine ones on loose earth, cover with a board, and stamp into the ground. For convenience with children, the very fine seeds may be mixed with fine earth and then scattered in rows or broadcast to be firmed into the ground. All small seeds should be planted the depth of their greatest diameter and larger seeds like nasturtiums four times that depth. Very hard seeds, such as castor oil bean and those of some gourds, should have the end opposite the little root stock cut with a sharp knife. Seeds like parsley, known to be long in germinating, may be soaked for twenty-four hours in warm water.

Lettuce needs abundant nitrogen. Cabbages, cauliflower, etc. are benefited by it if applied after they begin to head up. (They take phosphoric acid from the ground.) In sandy soils they would like some extra potash. Beets and turnips rejoice in extra nitrogen and phosphoric acid. Beans secure their own nitrogen through their colonies of bacteria. Carrots like barnyard manure with a little additional potash. Tomatoes like a similar enrichment with a nitrate well mixed into the soil at transplanting time. Clay soil suits cucumbers and squashes, while muskmelons



Plowed Ground



Raking Smooth

PLANTING OPERATIONS, I



3. Lining Out the Row
4. Making Furrow
5. Placing Seed
6. Covering or Firming Earth

PLANTING OPERATIONS, II

and watermelons demand a warm, light, sandy soil. Excess of nitrate will cause any one of the four to grow too rapidly and give a poor quality of fruit.* Too rich a soil will send nasturtiums to leafage instead of to bloom.

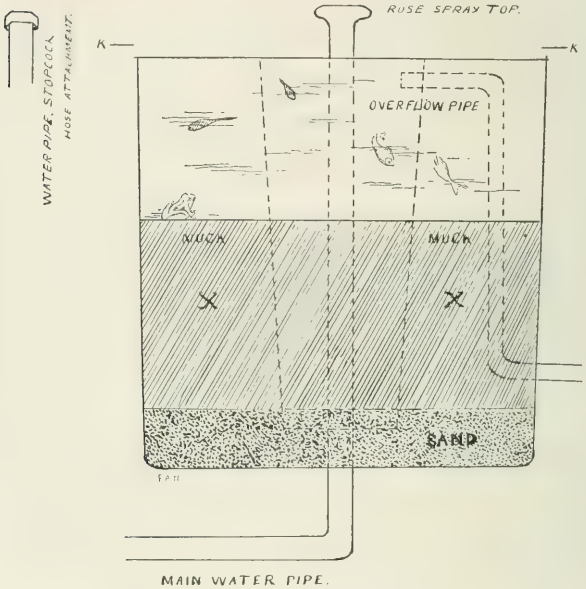
In addition to planting their own beds, enlist the children, as much as you can, to help plant the flower beds, sample plots, vines, etc.

On the chart of the garden, not only the children's plots but all others should be indicated. What and how many they are, will depend upon the extent of the garden. There should be at least a number of flower beds, the commoner vegetables not grown in the children's plots, and if possible, the common grains, grasses, kitchen herbs, staple cereals and one or two things such as peanuts or cotton or sweet potatoes to pique the children's interest. There should be a weed bed with the seeds carefully destroyed just before they are fully ripe.

"Perhaps you would like to know what flowers we raised. There was a most luxuriant growth of sunflowers, hollyhocks, gladioli and sweet peas. There were pansies, and pansies and pansies everywhere. Then there were large double marigolds, calendula, which are even now in bloom, fifty-seven feet of petunias, the same of dianthus pinks, and nasturtiums—handsomer than any I had ever seen before. Our borders of mignonette were perhaps more satisfactory than anything in the

* See Miller, Louise Klein: Children's Gardens, p. 174.

whole garden, making the air rich with fragrance for a long distance. . . We now have on hand for next year some fine nicotiana and sweet william plants.



AQUATIC GARDEN WITH FOUNTAIN

Cement basin with inside tub for clear water: approximate cost $15 to $20. Half barrels and nail kegs can be substituted.

"We used petunias, pinks, pansies, mignonette, and sweet peas together with autumn leaves to decorate one of our churches. The yellow flowers we had saved for one of the other churches, but Jack Frost forestalled our plans.

"I shall be glad to tell you something of our potato field, for as much, if not more, of our interest centered there as in the flower garden.

"The practical problems met in connection with the cultivation of potatoes were considered under three heads. First, the disinfection of seed by the use of formalin, to prevent scab; second, the relative value of different fertilizers, considered with reference to the needs of the soil; and, third, observation of the effects of Bordeaux mixture as a preventative of late blight."*

In planning and planting a garden, Louise Klein Miller's "Children's Gardens" is extremely useful with reference to all garden work, especially for planning effects, and for suggestions as to nature study. It contains a list of trees for the arboretum, of shrubs for planting, and of ferns for the wild flower garden. For one entirely inexperienced, H. D. Hemenway's "How to Make School Gardens" is most helpful. It devotes thirty-five out of ninety-six pages to explicit details of planting, arranged in twenty-one lessons. These lessons are as simply told as if they were to be placed on the blackboard for children to copy. The book also includes some account of the common weeds. For work with little children, Frances Duncan's "When Mother Lets Us Garden" has many delightful hints. Celia Thaxter's Little Classic, "Peggy's Garden and What Grew

* Palmer, S. T.: Vermont Circulars of Educational Information. No. XIII. (Describing school garden at Johnson, Vt.)

Therein" has become almost a text-book in many schools in connection with the school garden. "Children and Gardens," an English book by Gertrude Jekyll, is suggestive, though written primarily for home conditions. "School Gardening for Little Children," by Lucy R. Latter, who did so much for the school garden movement in England, has chapters which were originally written for the *Practical Teacher* "in the hope that the experience set forth might encourage other teachers to introduce nature teaching into their schools." It is very explicit, delightfully written, and full of helpfulness to both teacher and children. The "School Garden Book," by P. Emerson and C. M. Weed, is valuable. It outlines the work for each month throughout the year. Finally, of perennial interest, will always remain that pioneer, "The School Garden," by Dr. Erasmus Schwab of Vienna, the originator of this recent, happy means of making school and its studies delightful to children.

CHAPTER VI

AFTER PLANTING, WHAT?

CHAPTER VI

AFTER PLANTING, WHAT?

"It is of the utmost importance that children should acquire the habit of cultivating a plot of ground long before the school life begins. Nowhere as in the vegetable world can his action be so clearly traced by him, entering in as a link in the chain of cause and effect."—Froebel.

"Give a child large interests and give them young."—Alice Freeman Palmer.

LESSONS and experimental work in the garden will vary as it is or is not attached to a school, and somewhat according to the children's knowledge of outdoor life. There may be the difference between a review of some topics and a first presentation of them. When gardens come to be a part of the school curriculum, a very large percentage of the nature work now done indoors will be done outside. In this department surely the garden should be the "outer classroom of the school," to the great advantage of both children and teacher. Everywhere that the garden has been introduced in connection with the school, the universal testimony is that it stimulates the child to better intellectual grasp of his studies. Even where it

has been added to the routine of the school, the teachers say that the time required is a welcome break that is more than made up by the vim and expedition with which the pupils attack their other work.

Where the individual beds are not over 10 x 15 feet, actual gardening would not require more than fifteen minutes or, at most, half an hour each



A School Garden Class, Red Wing, Minn.

school day; not over one and a half to two and a half hours per week. Because of the nature of the work, its period in the school program is frequently not a fixed one. Cultivation, or tillage of their plots, to be most pleasurable to the children, should be something that they can enjoy when they please, or be sent to as a delightful change from their routine work. This is accomplished

in many gardens by allowing the children a wide range in the hours assigned for the general care of their plots, within which time they may come and go as they please. When the garden is accepted as a part of the regular school routine, this period is sometimes arranged by the principal, who, knowing the time best suited for garden work, may interrupt any grade lesson to send the children out, perhaps to take advantage of the hour after a sudden shower to mulch their grounds, to grasp some fleeting opportunity to study insect life, or to note some passing state or stage of nature. "The grade work may be made up any time; showers and sun do not wait; the garden cannot," was the gist of one Canadian teacher's belief and practice.

There should, of course, be some definite half hours set apart for possible outside work. Many times such periods will be suitable for it. When they are not, they can be filled by indoor work. Any suggestion that recess time be given over to gardening because it offers change of position, change of thought, fresh air and exercise for the larger as well as the smaller muscles; that in quality and quantity of work it may be adapted to all years, should be peremptorily vetoed on the ground that to be ordered to a task, however pleasant, is to take away the feeling of release from responsibilities, the sense of freedom, which is the very essence of a recess period. It should give the freedom to do as one pleases, to associate with

one's fellows as equals, and is essential to the child's welfare. A monitor might, however, be in the garden during recess so that any children who wish may go to their farms. Often, a shy or unsocial boy or girl would prefer to do so.

Whether the garden is correlated with school work or not,* there is a waiting time, after the planting, before the children can cultivate their plots. It will be a week or two before they may safely begin. If the children come but once a week their second lesson should be upon paths, and if the day is suitable, they should be taught to make them; it is essential that the garden from the first shall have an attractive appearance which will impress favorably all visitors. At the second lesson, in order to evoke greater interest in them, there should also be a little talk on seeds and what they are doing in the ground. Yet time should be left to set the outdoor housekeeping in order.

In regard to the paths, the children should first, with the handles of their hoes, measure their plots exactly, to be sure that the stakes are still in correct position at each corner. Carefully pass the garden line around the whole bed about two inches from the ground, keeping it taut. Each child should make two of the four paths that surround his bed, say the north and west, or south and east. Impress upon him that from that time on he will be responsible for those by-

* For chart of correlation, see Appendix A, Note 11.



TOOLHOUSE DECORATED FOR HARVEST FESTIVAL

ways; that upon them he is to stand whenever possible to do his work; and on them, not on his neighbor's, he is to throw his weeds or stand his weeding box or lay his tools. Children should be made to take certain paths in coming and going. A good rule is to follow the right hand path or paths to the nearest main one.

In making paths, the child should begin with the gutter. With the point of the hoe draw a deep groove directly under the garden line along one side of the plot and then along the other, for each child is to make but two paths. This gutter should be from one to three inches deep, according as the soil is dry and sandy or wet and clayey. Having made the groove, the child will then, with the back of his hoe, bank the edge of the bed at an angle of about 50 degrees. Next, with his hoe, he will draw the dirt up and away from the groove until it becomes the middle of the little gutter. The loose earth is drawn into the center of the path, or upon its "crown." A good rule is to have the center of the path a smooth, level, even surface, equal in height to the center of the bed.

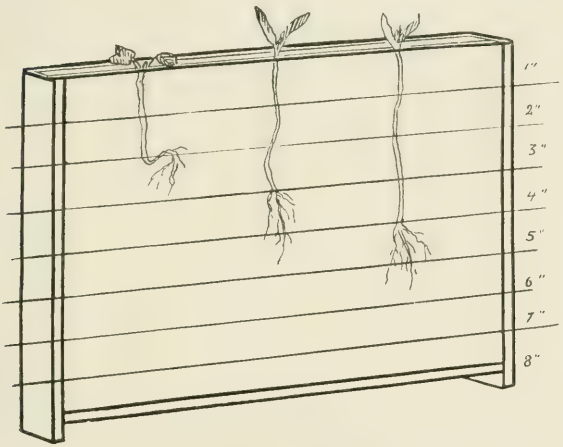
Narrow paths may be hardened by having the children tramp them down and pound them smooth with the back of a hoe. Broader ones are much better rolled hard. An improvised roller can be made of a bit of drain pipe with a piece of very tough, strong wood, or an iron bar for an axle, held in place by a filling of stones and rubble, through which cement has been poured. A

team of children can be harnessed to draw it.* Where seeds may be sown broadcast, as in some of the observation plots, this roller will be handy to firm them, provided the soil is not clayey. If it is, you do not wish by rolling and compacting to create a layer of hard, soggy crust through which tender seedlings may not have the strength to penetrate.

What are the seeds doing down in the dark earth? Are they all doing something, and in the same way, and why? These are the questions the children ask, and the true answers you want them to determine, to think about and to discuss among themselves. The question why the seeds do so and so is one that we must frankly admit cannot be completely answered. Nobody knows just why or how the seed develops. We see them do certain things and we say it is because God or nature put into each tiny seed a plan of life, and to that plan each seedling keeps, perhaps because it knows it ought. Anyway, each kind of seed clings to a definite plan of development through its whole life. Whoever has watched seeds of the same and of different kinds develop as far as they are able and then gradually die, knows that each one of them has one great purpose, which is to reproduce itself by seed, and to reach that

* In order to have it roll, when filling in the stones and cement the axle must be protected by a collar of wood or tin or something that will prevent adhesion to it and leave just enough space for revolving.

end there seems to be no plant that does not do three things. It makes another like, or better than itself, that will continue its kind upon the earth; it helps to keep the earth beautiful and habitable with a covering of green things; and finally each plant fills a place of real use,



Root Cage or Planting Frame. (Strings Stretched to Measure Growth)

as food, or as material to be made into clothing or as a thing of use or beauty. The lesson of reproduction is taken up again when pollination begins. The usefulness of the plant should be the strong point in lessons at the harvest time.

The plant's determination to make the best of itself in good or bad soil, in good or bad environ-

ment, is a daily lesson beginning with the baby seed. Accordingly, the children must see what is going on underground. It is not feasible for every child himself to conduct all the experiments, but as each should do as much work of that sort as possible, a number of experiments in germination can be made.* First, let the teacher arrange a root cage with garden soil, and plant at the same depth as the children did, one seed of each of the different vegetables. These will illustrate what is happening in the earth. But would every seed act alike? some child should be led to ask. By way of answer, let a group of children take a number of seed germinators and place a dozen or twenty seeds of one kind in each and later compare the germination in the testers with that of the same kind of seed in the root cage. Let each of the other children plant one or two seeds of each sort in different kinds of soil, sandy, clayey, etc., in moss, or even in sawdust.



VIEW OF END PIECE SHOWING GROOVES

Root cage, glass 8 inches × 10 inches; frame of lath, 9 inches × 11 inches; end piece width of lath; strips of lath put on to form grooves.

* In order to examine readily the very starting of germination, some seeds should be germinated on wet blotting paper placed on one plate and covered by another to keep seeds warm, damp and dark. They should be looked at each day, preferably under a microscope or magnifying glass.

Five or six racks containing chimneys or glass tubing cut in short lengths, would give nearly every child one bit of experimental work to watch and to record in his diary. The racks would not take up much room, and by turning them end foremost and using the first hole alternating with some other, each experiment with the same kind of seed could be lined up for easy comparative study. Similarly, other experiments with plants growing in dampness, darkness, or crowded as to roots, and also under opposite conditions, may be made. Suggestions and examples can be found in the United States Bulletins on School Gardening, in C. F. Hodge's "Nature Study," Osterhaut's "Experiments with Plants," and other similar books, such as Holtz's "Nature Study," and Coulter and Patterson's "Practical Nature Study and Elementary Agriculture."

Attention may be called to the weight of the earth upon the seed and to the force with which the plantlet pushes through to light and air. A flower pot filled with beans with just enough water to cover them, covered with a pan and the whole tied about in all directions with strong, firm twine, if left to stand a short time, will show the enormous strength and bursting power of that seed. Bottles, if loosely covered with cloth to catch the flying glass, may be used *by the teacher* to show how seeds with lesser power expand.

This lesson may be carried out to show how

rootlets pierce between and push aside the fractured rock particles which they meet. Attention may be called to the fact that even tiny moss or lichen roots, as well as the larger ones, give off a wee trail of acid that streaks the rocks and causes decomposition to set in along the trail. In many places, this is the first making of soil. The rock weathers enough to furnish food for the clinging plant, and, as the latter decomposes the hard surface, tiny seeds, blown by the wind or dropped by the birds, take root. Each plant as it lives and dies helps to form new soil until at last in the ledge of rock a tiny tree seedling may start and shoot upward, finding a fissure or crack through which to make its way; and thus by the roots which it pushes down in search of water, and the trunk which it urges upward in order that its leaves may get air and light, forces the rock apart.

The story of the dropped seed suggests other rainy day talks upon seed travelers, stories which are told in many of the nature books that are now before the public. Such suggestions are found also in Cornell leaflets, and in Nos. 2, 4, and 10 of the Hampton Teachers' Leaflets procurable at 5 cents each. The natural development of many seeds comes so late in garden work that it may be well to antedate their season with some talks about them to fill in the days before the first of the little farmers' harvests arrive. Later, there may be reviews and special studies. Ex-



CHILDREN OF THE NORMAL SCHOOL, LOUISVILLE, KY., AND THEIR TULIPS BLOOMING IN MARCH

periments showing the exterior and interior of seeds, their outer and inner coats, their various embryonic development, the pattern of the tiny plant, as well as its store of food for the seedlings, suggest themselves. The vitality of seeds furnishes many useful stories. So, too, do lessons on the different kinds of roots, these latter to be reviewed as the various root crops are harvested. Lessons on branching, budding and plant development generally, come naturally as talks while the crops are up and growing. Brief cooking lessons will suggest themselves when there are things to take home to eat.

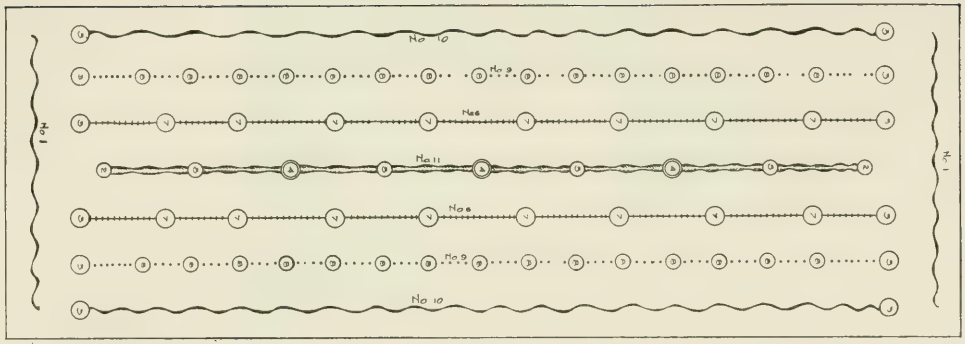
Some specimens of plants that are cultivated in the vegetable gardens for their roots or leaves, must be allowed either there or in the observation plots to go to seed so as to show that they complete the round allotted to all plant life. In the observation plots, however, the weed seeds must not be allowed to ripen. Some of the seeds gathered from last year's field and pasture may be used to show their methods of bursting forth for travel. Some attach themselves to an animal's fur or to clothing for free passage (as do "stick-me-tights" on children's stockings), while others, like the dandelion, or the milkweed which spreads its tiny sail to the wind, depend upon the air for transportation.

The Department of Agriculture puts up for $2.00 apiece, two interesting collections of seeds of one hundred each. Some seed forms are so

curious that it is well in passing just to introduce them to the children *as seeds*, for they might not be recognized as such; some of the nuts in our stores, for instance, or the seeds of certain unfamiliar kinds of fruit. There are the interesting black-eyed Susans and the pearl gray seeds from Hawaii, the "Job's tears" of which necklaces and sometimes rosaries are made.

Many stories of the ways and life of people are found in the plants. Nearly every child knows the story of Sir Walter Raleigh and the tobacco plant. Many know the history of the white or Irish potato; but few adults know which of our garden vegetables are very, very old, and how many are of recent development. Nor have they had a glimpse of the fascinating life of adventure and travel that brought us tea and rice from China and India; the radish and the onion from Asia and Egypt; and, far more recently, the tomato from semi-tropic regions of our own continent. A few of these stories do not come amiss and may be found suggested in botanies and in agricultural or horticultural encyclopedias.

This is some of the work that may be scattered through the summer; with it comes the daily cultivation of the gardens. Cultivation may begin as soon as the plants are about two inches high, if it is carried to within two inches only of the seedlings. There will be also the daily care of paths; the daily work in company over all the

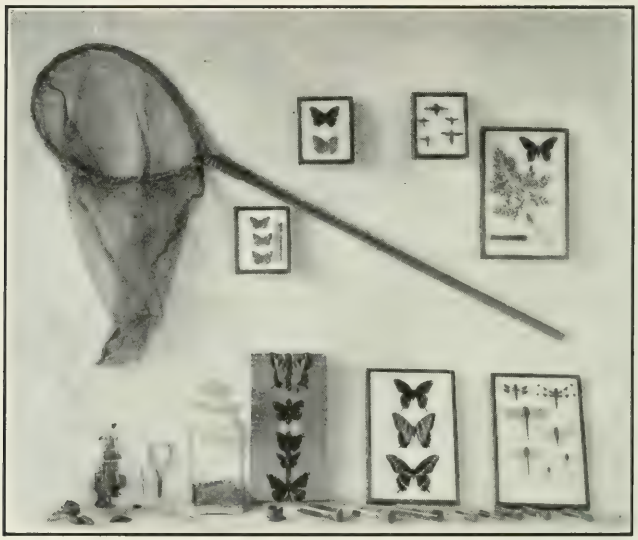


$\frac{1}{4}$ inch = 1 foot. Plot was 20 feet × 7 feet.

No. 1. Carrots
No. 2. Egg Plant
No. 3. Kale
No. 4. Tomatoes
No. 5. Peppers
No. 6. Radishes
No. 7. Cabbages
No. 8. Early Potatols
No. 9. Beans
No. 10. Red Beets
No. 11. Lettuce

Planting Plan (Showing Succession of Crops), Willard School Garden, Cleveland, O.

common territory of main paths and observation plots; the occasional thinning of seedlings with the opportunities for teaching both plant and human hygiene and sanitation; the replanting of plots and lessons that may be introduced at



OUTFIT FOR INSECT STUDY

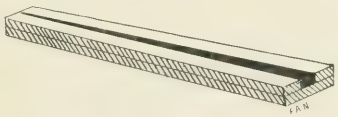
Costly glass mounts can be replaced by a strip of cotton batting enclosed between two panes or sheets of glass, bound together by strips of surgeon's plaster.

Net made of a loop of 12 inch wire bound to a handle of bamboo. To the wire loop a bag of mosquito netting may be sewn or lashed.

such times on rotation and succession of crops. Finally, there are the lessons in the value of harvests, whether of flowers and vegetables on the little beds, or of the crops on the sample plots, or their relative values on the experimental beds.

In addition to lessons in plant life we have the story of the whole society of animal life that gathers in the garden. Toad and worm have their story as well as insect and bird. Insect life is good or bad, beneficial or injurious.

Among insects, the helpful lady-bug; the harmful aphis or plant louse; the useful scavenger beetle, and the destructive potato bug; the striped beetle that troubles squash and tomatoes; the curious click beetle and the voracious cutworm and wire worm will demand attention. The cabbage butterfly will in a few short weeks give a typical life history in a completed round. It also will illustrate the reason why each year as a nation we lose so many millions of dollars through insect depredations, and why we need the birds to help us keep down their number. The parsley worm and tomato worm will develop for us into beautiful fliers, one a brilliant-edged swallow-tail butterfly, and the other a superb moth. On milkweed may be found the caterpillar of the vivid Monarch butterfly, known in some places as the "Princeton" because of its yellow and black. The bee, from a safe vantage point, may be studied as he visits the flowers and carries the pollen from one gay flag to another hung out

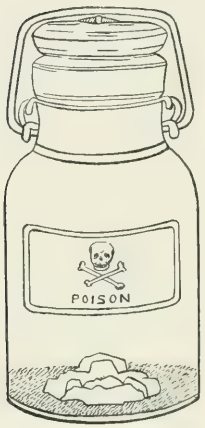


INSECT SPREADING BOARD

* See Appendix A, Note 12, for check list of 34 common butterflies.

to tell him of hidden treasure; or his habits may be more thoroughly investigated if the garden is rich enough to possess a model hive. The visiting birds and the toad come in also for watchful study.

Each teacher must plan her own outline of work and adapt her day to any special study its events may suggest. Set lessons may have to be used in handling large numbers of children, but the ideal would be friendly talks with little groups, apparently on the spur of the moment, yet having a line of sequence running through the entire summer's work. One good manual, like Comstock's or a book like Weed's on "Insect Life," or United States bulletins such as No. 196 on the Garden Toad or Nature Leaflet, No. 18, Mass. State Board of Agriculture, on Aphids, will contain sufficient accurate information for the teacher who has had no training in nature study or science.



"Killing Jar."

Cyanide or "killing jar" may be an ordinary preserve jar or any wide-mouthed stoppered bottle that may be tightly closed to keep in the poisonous fumes from the lump of cyanide. This should be set in plaster of paris.

In the garden there are occasions for some of the florist's operations of seeding, potting, transplanting.* One graphic rule serves for transplanting as well as for thinning, and the children can more readily remember it than a number

* See Appendix A, Note 13, for directions for these operations.

of fixed distances. It is based upon the fact that plants should not interfere with one another, and that there is a general proportion between the size of root and leafage which can be illustrated. Thus, if the children, when ready to thin beets or transplant lettuce, are told to recall the size of the beet root or of the head of lettuce as they have seen each in the store; to draw roughly on the ground a circle of approximately the same size; and then to draw another similar circle just touching the edge of the first, they can see that the distance between the centers of the two circles would be about the distance apart that the plants would have to stand so as not to interfere with each other.* Such a rude estimate would cover all the common vegetables; though in the case of unfamiliar growths, like corn and beans, the necessary distance would have to be given them.

There are some details of the school garden that relate to the teacher more than to the child, which should be considered. Where a school garden has several members on its staff, they should be so selected as to work in perfect harmony and with loyal obedience to their head, who should be capable, generous-minded and considerate. He or she should be competent to superintend the garden and all its activities; generous to give credit to the assistants for work well done or for helpful suggestions; reasonable in planning the work for both children and subordinates, in

* This method is suggested by Mr. Henry G. Parsons.

sharing plans, present or future, with fellow workers, and considerate with assistants and children while they are carrying out the scheme of work outlined for them—for here, weather interruptions, human frailty and the unexpected sometimes dislocate the best laid plans. Nowhere is



Thinning his Plants

there greater need for care in selecting the personnel of a teaching staff; nowhere does character count more than in the intimacy between children and teachers which the garden fosters. Tact, good judgment, justice, firmness, gentleness, directness, sympathetic understanding of child nature, normal sensibilities, a wholesome sense of

humor, tolerance, patience, ready forgiveness and large hopefulness are fundamental qualities for a teacher.

These virtues allay antipathies, ward off hostility and arouse gratitude in children and neighbors. It is well to remember in handling the chil-



"The Father of the Man without a Job"

dren, that they are frequently human barometers subject to the personal atmosphere of the garden or the home. Put yourself in the child's place, with his experience, his often incorrect knowledge and the prejudices of his environment. If he errs, reason with him for his good, not because of

your broken discipline or offended dignity. Each day clean the slate of his misdeeds. Have peace between you and welcome him each morning with a large hopefulness for his future. Be merciful, —for he may encounter only indifference or neglect or temper at home. These do not grow easier to bear by frequent experience, and in all classes,



Normal Student's Home Garden, Washington, D. C.

children receive occasionally the equivalent of the quick blow or the gruff command. The habitual courtesy of teacher to teacher and to child finds itself reflected in deference and gentleness of mood in the child, though sometimes expressed in far from polished phrase or gesture.

Dress, too, has its effect. You are trying to cultivate the child. Old clothes,—clean, whole, unadorned,—have a rightful place when man or woman is grubbing in the ground. They may be more appropriate on some work days than on others when a simple suit with some style to it and, in case of a woman, with a touch of pretti-



Writing up the Day's Diary

ness, would not be injured and would eloquently preach a number of lessons. Not economy and adaptability, but slouchiness and disorder and lack of thrift are taught by the torn shirt sleeve, the broken shoulder brace, the skirt pinned and sagging at the waist band, and the old finery or gown or blouse "good enough for garden work." Jewelry, beyond ring and pin and watch, is an

abomination, and may become a temptation if carelessly laid down. A practical shirt-waist suit or wash dress, or clothes of a color that does not show the stain of dirt and soil, are needed. Even with the children there should be insistence upon cleanliness, upon neatness (with reasonable consideration of their social class), and upon proper clothing—if there is a tendency to over or under dress. Overalls and aprons are appropriate.

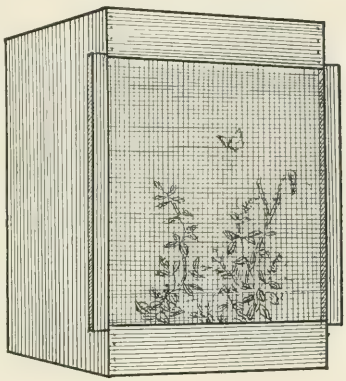
Garden records should always be kept, both for immediate use and later reference.* They may be:

1. Child's records.
    a. Daily attendance.
    b. Daily weather report.
    c. General work each day.
    d. Daily harvest.
2. Records of visitors, or the Garden Guest Book. (This pleases the children, their parents and visitors.)
3. Principal's records.
    a. The day's work for the children, as prepared alone or in conference with the assistants.
    b. Work accomplished by the children.
    c. Record of each child's attendance, conduct, harvest.
    d. Record of visiting classes.
    e. Record of nature study material or of flowers supplied.

* For types of records from School Gardening for California Schools by B. M. Davis, see Appendix A, Note 14.

f. Miscellaneous records, of trips by the children to other schools, parks, experiment stations, and of any events worth registering.

Summer work in the garden will include some carpentry, such as repairing of tools and making of apparatus. It should include some cooking.* Even though there be no opportunity for house-wifery, a few simple cooking lessons can be given over an oil stove in an improvised and sheltered corner kitchen; or better, the cooking can be done with one of the steam cookers that range in price from $5.00 to $7.50. This method demonstrates economy in fuel, as would also a fireless cooker which is easily improvised. The cooking could be done in connection with a guest day. A vegetable dinner, a salad supper, or a "green tea" is a great drawing card to interest the children's parents. In fact it is a good thing to have a "parents' day" regularly and frequently with either some such feature as just mentioned or



HOME-MADE BREEDING CAGE

A large chimney standing in saucer or flower pot or fitted into a block of wood, if its top is covered with netting, will serve.

* See Appendix A, Note 15

an interesting talk upon some topic connected with the garden. The parents represent the taxpayers and public opinion, and when *they* approve the school garden sufficiently to demand it, the ward politician will get in line with the best educational leaders who are doing all they can to push it. In order not to be swamped by guests, or embarrassed by financial problems, these social occasions can be apportioned among different groups of children, who will entertain their parents or friends at stated times.

From the first day that the garden is open to the last, cultivate the good will of all in the neighborhood. It is much more creditable to elicit voluntary help, or even successfully to beg assistance, than for a teacher to accomplish everything by herself or through her coteries of friends. The garden is for the children and they are to feel that they own it; that they largely make it what it is; and it should be among their people, for their people, and enthusiastically encouraged by their people.

CHAPTER VII

AN INTERLUDE: SOME GARDEN WEEDS

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"One can imagine no more irrepressible rabble than these weeds of the garden. They seem possessed almost of a conscious life, and to push and shove and scramble for place like a hard-headed, thick-skinned, piratical crew."—S. D. Kirkham.

SCARCELY thirteen years ago John Burroughs in a chapter on a Bunch of Herbs made an interesting sub-division, Weeds, and in the "long list," as he calls it, 42 were given. Today the United States Department of Agriculture issues a "set composed of 100 samples of weed seeds—those most commonly found in the commercial seeds of cultivated plants." It "is intended for the use of educational institutions and seedsmen in identifying seeds by comparison." Considered as the bane of a school garden a large proportion of these weeds may be omitted; not because they are not bold robbers of rich soil but because many of them belong to special areas of our country, and in their local haunts are as well known as is the dandelion everywhere. If they occur in the school garden it will be as isolated individuals or as a plant colony, and prob-

ably come up in the sample plot according to the seed that has been sown and that seed's most intimate enemy.



First Year's Growth of Yellow Dock

In school gardens of from 5 to 10 acres where the sample plots are of considerable size, or in gardens connected with agricultural schools or colleges, the weeds would be immediately recognized by the trained teachers in agriculture who are usually in charge. If they occur in the city school garden or the small rural one, they are often easily placed as to their name and history by a careful study of the crop in which they appear. If local conditions supply no opportunities for this kind of research, and helpful bulletins cannot be had from either Washington or the State Experiment Station, the weed will be identified if sent to the latter. Moreover, your sample



Jimson Weed

plot seed has probably been sown in drills or rows. (One can usually get as much or more on the same area and cultivate it more easily than when sown broadcast.) Seedlings and weeds will come up together, but only a very short time will be needed before the characteristic appearance of each will disclose its variety. Rarely is seed so adulterated that the weed equals or exceeds the plant desired.

It is only the weed in the rows that need cause trouble, for proper cultivation between them should eradicate the foreign population when young. In its youth the weed is not sturdy, whether youth be considered in relation to actual age or to its appearance in a new locality. Beware of its second season. If it is an annual, though it die, it has first scattered its myriad children. If it is a perennial, it has not only done this but has firmly established itself, prepared to increase by its roots, by underground runners, by division of root, by rooting joints, by suckers or by more than one of these, or by all, so tenacious of life are weeds.

"The most human plants after all are the weeds. How they cling to man and follow him around the world! How they crowd round his barns and dwellings and throng his garden and jostle and override each other to be near him"*—and what good turns they sometimes serve him!

If we look at weeds for their food value we find

* Burroughs, John: A Year in the Fields, p. 135.

first of all, perhaps, the dandelion and water cress; at least, these are the best known. In different sections of the country, different weeds may be utilized. In old New England many were used that are still used occasionally. The introduction of, and great improvement in our now common vegetables relegated the weeds to an obscurity out of which, today, several have been brought by the customs of different nationalities among our poorer people.



PLANTAIN

Flowering spike of common plantain. Broad leaved plantain or hen-bread.*

A school garden should strive, particularly in the cities, to introduce as varied a dietary as possible, by teaching the use of all garden greens and by calling attention to the edible ones among the weeds. Among these are milkweed, which offers in its young and tender shoots material for salads. These shoots preserved in layers of salt until winter time, shaken free of it and rinsed, will give greens for the pot. This use is common still in parts of New England. As a pot herb also may be used that scourge of the garden,

* From Bailey's Cyclopedia of Horticulture. By permission of the Macmillan Co.

purslane or "pussley." An eighteenth century writer speaks of it as being "little inferior to the asparagus." We can cheerfully consign it to the boiling cauldron. In the garden it is most pernicious, spreading rapidly and re-rooting at every joint left carelessly in the shade or in damp earth. Its small yellow flowers open in the hot sunshine for only a few hours, but spread their seeds generously. These are of so great vitality, that if deeply buried and years after accidentally brought near the surface, they will spring to life again. Its smaller leaves are used for salad and for garnishing. Purslane and its cousin, the portulaca, have many habits in common.



Common Purslane or Portulaca Oleracea*

Cape Cod people use golden or marsh dock and seashore plantain or "Goose Tongue," while inland folks use curled dock for a pot herb and occasionally the common plantain. The docks are cousins to the sorrel or sour grass. The family resemblance between the two is strong. There is a little garden weed called wood-sorrel, with leaves and yellow blossoms closely resembling the cultivated oxalis and belonging to the same family. As children, we have all sampled peppergrass and

* From Bailey's Cyclopedia of Horticulture. By permission of the Macmillan Co.

used it for our children's parties long before we knew that some varieties of it were cultivated for salads. We readily accept beet tops, spinach and Swiss chard as greens, but question the use of the coarse pigweed whose tender shoots are as much sought for food in some sections of our land as were the young branchlets of the common nettle, which the early colonists boiled for pot herbs.



Couch Grass

Some of the beneficial weeds or medicinal herbs are described in the "Thirty Poisonous Plants of the United States."* With the exception of the poison ivy and oak, they are not likely to injure man, but only animals that accidentally crop them. In Farmers' Bulletin No. 28, Weeds and How to Kill Them, some ten weeds are considered as very obnoxious from the farmer's standpoint and pertinacious in their hold on life. An even hundred are listed and their characteristics tabulated. Of these, some 25 or 30 are fairly universal, appearing in cultivated fields and in the small garden.

* Farmers' Bulletin No. 86. See also No. 188, Weeds Used in Medicine.

Some few are more common in the roadside colonies. The road is the place all weeds love, —as much as does the human traveler or tramp, —if they have means of their own by which to travel or fly or even if they must steal a ride to some new home by hooking on to coat of passing man or beast. From the road, we would not wish to banish them. There, we who ride or tramp for pleasure appreciate their color, and their form, but less often know their queer and curious habits, and means of survival in the wayside struggle for life. When in some region we find what we may have known as a nuisance, safely cultivated as a flower, we are impressed with the truth of the saying "a weed is a plant misplaced."

Weeds, then, are excellent from an æsthetic standpoint. In nature's plan they cover with a restful, cool mantle of green every waste place that man fails to cultivate; and there is a touch of grim satire in their luxuriance, as if "the rough muse" were bidding man discover how rich the earth for his own use, how costly his neglect to reap such wealth. In nature's realm, weeds—most prolific of seed bearers—have their economic value also. The despised ragweed, for example, holds its seeds until the birds in winter need them to satisfy their hunger. Fall brings the time when insects hibernate and our year-round birds become vegetarians on a diet of dry seeds, for which, as supply houses, the weeds figure largely.

But coming to the school garden on a hot summer's day, the sight of a luxuriant growth of weeds may banish all their uses from our minds. Our mental attitude shifts and our only thought is of extermination. Many of our plant pests, particularly those of foreign importation, multiply



Woodbery Garden, Baltimore. The Lot Before Cultivation

so rapidly that they sometimes take over entire fields. They love the land of room and liberty.

Children love the black-eyed Susan or Dutch daisy and the white or ox-eyed daisy. Honesty compels us to count them among the farmer's worst enemies along with sorrel, wild mustard,

wild carrot, hardhack, chicory and cocklebur. Asters, goldenrod, milkweed and rag-weed are among the rank plants of our roads and fields. Asters and goldenrod we should sorely miss. Every country boy or girl knows the milk-weed with its juicy stems spilling milk at every crack



Woodbery Lot After the Children Made Their School Garden

or break, its boat-like pods laden with silk of finest tissue, beautiful in texture as the precious fabrics brought from the Indies. Its deep reaching roots are as strong as its seeds are ephemeral.

The ragweed loves to lift its handsome head with greenish-yellow powdered flowers, above the



Pigweed*

much branched stem and finely divided leaves, and to throw far and wide its acrid, unpleasant perfume. This is a cousin of the imperial Roman wormwood, the "ambrosia," taunting name to hay fever victims.

In the garden soil there are layers upon layers of weed seeds of different vitality and constitutional needs. "If I uncover the earth in my fields, ragweed and pigweed* spring up; if these are destroyed, honest grass or quack grass or purslane appears; the spade or plow that turns these under is sure to turn up some other variety, as chickweed, sheep sorrel or goose foot."† Let us add the pretty smartweed,



Carpet Weed

* Known also as bacon weed, lamb's quarters. There is also a rough pigweed.

† Burroughs, John: A Year in the Fields, p. 137.

the dainty, exasperating carpet weed, shepherd's purse, the thistle (it will be an English or Canadian or even Russian specimen, not our good American, which clings to roadside, swamp and wood), the bindweed (one of the wild morning glories), the wild cucumber (an excellent friend as a cover vine



Leaf, Spike and Root of Broad-leaved Dock

if its seed pods be picked before they ripen). Then there is the live-forever, out of whose thick leaves children make bags, by slowly and carefully rubbing the tough skin until it loosens and forms a pouch. The jimson weed* with its large, curious

* It is one of the night-shade family as are both black night-shade, a garden weed, and the common white potato, and is classed

and prickly seed-pod and its luxuriant growth, is liable to appear in any garden made from a vacant lot. Then there are the speedwell with its very tiny white flowers, the galinsoga, also with little white flowers and rough leafage,—new importations that threaten our garden kingdoms,—while our own evil poison ivy frequently crops up.*

On farms and large areas, special means may be used to eradicate certain weeds, as spraying for wild mustard. There are some chemical preparations that used in small quantities will kill weeds in walks and grass and yet not injure the latter. The only absolute remedy since all gardening began is frequent tillage. On tiny plots the cultivating stick, on small beds the hoe; on larger plots the wheelplow and on large tracts of land the horse or traction machine are needed. "The weeds are not easily discouraged; they never lose heart entirely; they die game; if they can't have the best, they will take up with the poorest . . . . in all cases they will make the most of their



First Year's Growth of Broad-leaved Dock

under poisonous plants; consequently it is well to warn the children not to put any part of it into their mouths

* See note at end of this chapter for this plant and for popular names of common weeds.

opportunities"*—and herein lies the only speck of morality in weeds. When you are fighting them, if you let them get the best of you they are a giant rabble, or a low-down, back-breaking, pestiferous crew. They even tell tales, for by their growth they tell the experienced eye what sort of discipline—or care—the garden has had.

POISON IVY

(Poison ivy, poison vine, poison creeper, mercury or markry and three leaved ivy, usually climbing or trailing but sometimes erect in growth.)

Teach the children it has three leaflets while the woodbine or Virginia creeper, for which it is often mistaken, has five. The ivy has masses of white berries standing out almost straight from its stem; the woodbine has smaller clusters of deep purple berries that droop. Birds spread the ivy seeds so that it may appear in the school garden in sections where it is common in fields and pastures or along the roadside. Poison ivy is harmless to many. To others it is a rank poison because of the non-volatile oil found in all parts of the plant even when seemingly dead. Consequently, it ought never



Poison Ivy

* Burroughs, John: A Year in the Fields, p. 158.

to be burned, but be rooted up by someone who is not susceptible to the poison. It may also be killed by putting a half-teaspoonful of concentrated sulphuric acid on the stem every two or three weeks during the vigorous spring growth. The poisonous oil can be carried on the hands, clothing or towels from the immune to those who are not. Those who have to handle poison ivy should wash their hands several times—and their clothing in strong soapsuds. The common remedy for the poison is sugar of lead dissolved in 50 to 75% alcohol. Pure alcohol will kill it if applied to the first eruption, and if it is not spread by scratching. Various other remedies are often suggested. Light cases will usually cause more or less discomfort for a week or ten days; but ivy poisoning can be a very serious matter. For those who know themselves to be unusually susceptible a daily rubbing especially of hands, neck and face, with a cloth wet with alcohol, may act as an armor against its attacks. To such, a crystal of citric acid, dampened and rubbed over the spots as soon as they appear, and repeated frequently, is a safeguard. Such treatment will usually cure in from twenty-four to forty-eight hours.

POPULAR NAMES OF COMMON WEEDS

1. Burdock, cockle button, beggar's buttons, hurr-burr, stick button, hardock and hardane.

2. Mullein, great mullein, velvet plant, velvet or mullein dock, blanket leaf, flannel leaf, feltwort, old man's flannel, Adam's flannel, Jacob's staff, Jupiter's staff, Peter's staff, Shepherd's club, candlewick, torchwort, torches, hedge taper, lungwort and hare's beard. A stalk has been known to have 60,000 seeds.

3. Broad-leaved dock, little dock, blunt leaved dock, button dock and common dock.

4. Yellow dock, curled, narrow or sour dock. This, the broad-leaved and the yellow-rooted water dock are used in medicine.

5. Couch grass, dog grass, quick, quack or quitch



Mullein



Flowering Plant of Burdock

grass, twitch or witch grass, wheat grass, quake grass, Dutch grass, devil's grass, creeping wheat grass and various other names. Plough up the roots and burn them, for they are long and tenacious of life, oozing with vitality at every point.

6. Jimson weed, Jamestown weed, apple of Peru, thorn apple, mad apple, devil's apple, common stramonium.



MULLEIN

CHAPTER VIII

THE SCHOOL GARDEN IN VACATION AND TERM TIME

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THE SCHOOL GARDEN IN VACATION AND TERM TIME

"The earth is here so kind, that just tickle her with a hoe and she laughs with a harvest."—Douglas Jerrold.

"This movement is one of national importance—one that is destined to have a profound influence on educational thought and educational method in this country; it supplies one of the glaring defects in our system of elementary instruction."—W. J. Spillman.

THE scope of the instruction in a school garden varies greatly, from simple cultural directions at one end of the scale to the full use of all that its vegetable and animal life may suggest to the trained school gardener or skilful teachers with which it may be connected. While trained school gardeners remain in the minority, gardens conducted during vacation time are likely to confine themselves to the simple cultivation of plants. Where they possess a trained staff, their activities are utilized to the utmost. Keeping in mind these variations in scope and purpose, the school garden will now be considered, first, as an occupation for the vacation time, and second, as an adjunct to or a corporate part of the school.

Of school gardens which exert by far the greater part of their influence during the summer there are (1) those that belong to the vacation school;* (2) those that emphasize that phase of agricultural training known as truck gardening; and (3) those that serve a sociological rather than an educational purpose. They are actually social centers for the children, though they may or may not be centers from which radiate such activities as properly constitute a social settlement. They may offer no more than the opportunity to cultivate a few flowers and vegetables together with directions for the use of insecticides† to a group of children that it is desired to benefit by wholesome occupation. They may be conducted for every possible attraction that will enable them to hold and to mould children; to give the latter happy hours and cultivate their hearts and minds while training their hands to useful toil. Some vacation gardens hold the child's interest in growing things throughout the fall and winter, by indoor study of nature, and by work among plants in a greenhouse or under sash. Further, such gardens sometimes supplement this work by courses in manual training preparatory in part to

* School gardens belonging to summer students of normal schools or universities are a class by themselves,—often hybrids. They are wholly in the hands of adults or they are children's gardens receiving summer care; or, if children are connected with them, they are pupils from a vacation school or, more frequently, volunteers from among the school children of the vicinity.

† See Appendix A, Note 16.



HOME GARDENS OF TWO BOYS OF THE "TRAINING GARDEN"

the employments of the garden; by elementary arts and crafts work, and by maintaining a winter playground and club house.

Gardens in connection with vacation schools are likely to suffer from the fact that the school is open for a short season only, and also from the meagre and short-lived support which their share of the vacation school funds usually provides. Unless outside aid can be secured, the garden runs the risk of having to close before the crops are ripe, which is not fair to the children.

Of the second class of gardens, three have already been mentioned; namely, the pioneer garden of the National Cash Register Company at Dayton, the garden of the School of Horticulture at Hartford, Connecticut, and the Training Garden of the Home Gardening Association of Cleveland. In each of these the work is planned preëminently to give a practical, serviceable, remunerative knowledge of truck gardening. Yet the underlying aim of Mr. Patterson and Dr. Goodwin, the founders of the two first named gardens, was the broad purpose of developing the boy through the labor performed, the special knowledge gained, and habits formed. The same desire to cultivate boys as well as plants, prevails at the Cleveland Training Garden. Because its method of training is so individual and because the boys are encouraged to stay for play, this garden in a measure falls into the third class of vacation school gardens.

These three gardens give a graded system of work which, however, is only loosely defined at Cleveland and Dayton. In the former city, the boys are in charge of a superintendent and assistant teacher who take the greatest pains to make them realize the freedom accorded them in the garden. Each boy's development, as agriculturist and



Comparing Crops

embryo citizen, is watched over. The gardening program is not yet completed but the intention is to develop a three years' course and, perhaps, to end it with a taste of nearly all the activities of a farm.

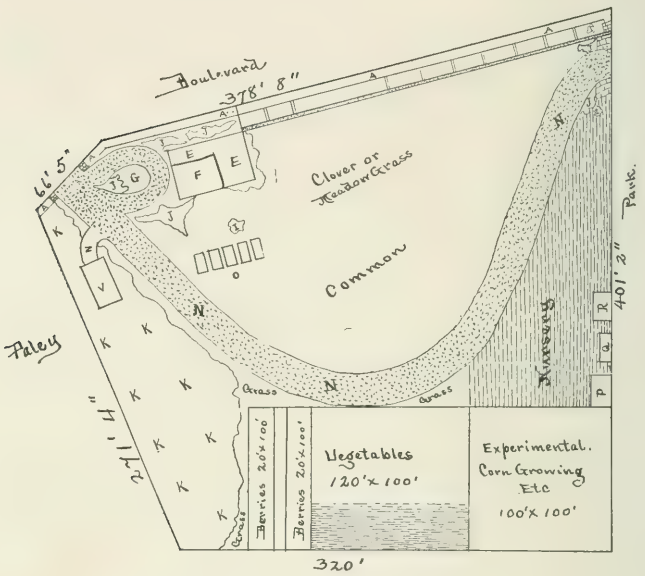
At Dayton, a trained gardener, one fond of children, is employed to have the care of the gardens and flower beds, and to inspect and instruct in the boys' section. The Hartford

plan is different. Not so much attention is given to nature study. Easy, graded, outdoor lessons are given in horticulture and in some of the work in the greenhouse, together with the budding, grafting, and transplanting that can be done in the tree section, grapery and small fruit areas. The director, the superintendent of grounds and the assistant teachers have the work in charge. There is a progressive scheme of planting. The first year, the seeds are selected. The boys of the third and fourth years are allowed considerable latitude in the selection of their crops.*

With such gardens as these three may be classed the many others which hold the child by the appeal to what he can make. The older boys from twelve to sixteen are past the age to play at being farmers. They want work and a relatively large area of crops to show for it. They are willing to work if they can have returns that seem worth while either as a frequent contribution to the family table or as a sum total represented by so much cash at the end of the summer. Experience teaches that from a business point of view, the plot should be at least 8 x 10 feet if the child farmer is to make any profit, while such a garden would require at least three half-hours a week for cultivation. The older boys, if they can give the time to it, want plots at least 10 x 20 feet and better 10 x 30 feet. The rule that goes into effect

* See Appendix A, Note 17.

at Hartford in 1910 is that plots for the first, second, third, and fourth year boys respectively



What Park Life Boys Plan

A. Hedge, Thunberg's barberry (raised in nursery). B. Flower beds, bordering entrance walk; double beds 10 feet x 20 feet for two beds. C. Entrance walk; D. Shrubbery at base of loggia. E. Loggia or roofed porch. F. Bungalow. G. Carriage turn. H. Rear entrance. I. Norway maples. J. Shrubs and small trees. K. Evergreens. L. Stable or work house. N. Service road, 16 feet wide. O. Tents. P. Tool house. Q. Hot frame. R. Cold frame. Common, for drill, games, etc.

shall be 8 x 20 feet, 8 x 30 feet, 8 x 40 feet, and 8 x 50 feet.*

* See Appendix A, Note 18, for the returns from a 4 x 8 feet garden, from one 10 x 30 feet, and one 8 x 16 feet.

Of the vacation gardens that are being conducted chiefly for their sociological value, several have been mentioned. They look to the development of the child, the social unit of the future, and to the immediate effect that his improvement may exercise upon his home and neighborhood. Some of the best-known examples follow:

The work of the Boys' Brigade, Toronto, Canada, does not center in the garden, but the latter is counted one of the most valuable departments and its products are honored with many prizes at the annual fair which the boys hold.*

Mrs. Henry Parsons' garden at DeWitt Clinton Park, New York, is a model of what a little ground can do each season for hundreds of children, giving them a safe place wherein to gather, and happy work together, with better ideas of life and its meaning.

At Dubuque, Iowa, Park Life School Garden offers boys a new kind of school through the summer months,—an outdoor school of life. There must be provision for the boy's work and for his play; for his instruction through the experience of others and through his own experience; and more important still he must learn the conduct of life. Accordingly, boy officers with the help of their adviser-in-chief manage Park Life School Garden and conduct their magazine, "Park Life." In the school garden, the boys are instructed in

* See page 15.

cultivating the ground, in raising vegetables and flowers; in the near future they will also have practical work in tree and fruit culture. From the garden they must provide largely for their daily food, because for a part of each summer they live in tents on the high bluff upon which their garden is located. From the camp they can see far



Park Life School Garden, Dubuque, Iowa

up and down the Mississippi River and over into Wisconsin. Part of the summer program includes a week of tramping or driving through the country round about, which is rich in historic and geological interest. A daily talk or lecture is given upon some phase of the boys' work, while the swimming pool and the joy of camping offset lessons and work. The gala week of the summer

is that when teachers of note are invited to the camp to instruct the boys, not formally, but by close companionship with them and by lectures or talks especially adapted to their day's occupation. Writing of his plan, Mr. B. J. Horchem, the Adviser-in-Chief, says: "Millions of dollars are given to endow colleges, but ninety-five per cent of the



The Daily Lecture for Park Life Boys

boys never reach college at all; the five per cent or less that do, are old enough to help themselves. The boy who enters Park Life is in the greatest need, because it is before his labors are worth anything, and at a time when he will learn to feel that he has a part to play in life, and that he will learn to know his part and play it well."

Fairview Garden School, Yonkers, is now supported by the people of that city. It was started about seven years ago by Miss Mary Marshall Butler, President of the Women's Institute of Yonkers. In 1909, the Fairview Garden School Association of Yonkers was formed to manage and provide the running expenses of the garden. Its call for $5.00 per boy was promptly responded to. The Russell Sage Foundation allows the Association to use the land, club house, and greenhouse at a nominal rental.

A large building upon the estate was renovated and used in the winter of 1909–1910 as a club house for boys and girls, a number of whom had had gardens during the summer. Its object is to provide normal social and educational activities through clubs, talks on outdoor life, stereopticon views and formal lectures, and as far as possible to relate the winter work with that of the garden so that interest in the latter may be continuous throughout the year. When the house was opened the children came in such crowds that they had to be divided into three groups, and these again subdivided according to age. Over 800 children are registered. The house affords accommodations for reading and game rooms, a Penny Provident Fund station, clubs and classes. A Junior Civic Club and a City History Club are projects of the future.* The Green Leaf Club and the Vegetable Class include children who had

*See Appendix A, Note 19.



THE NEW HALF OF FAIRVIEW GARDEN SCHOOL, YONKERS, N. Y.

This garden sent, weekly, two wheelbarrows full of flowers to the New York Hospitals. Notice the boy with watering pot with very long spout.

gardens last year. Members of the latter are carrying further the study of the vegetables they raised. They use their summer note books and add items from the winter course. Home work is encouraged and each member must grow at least one plant, even if the pot be only an old tomato can. The children are thus held together throughout the year by their play and social instincts and their delight in watching what they have planted come to fruition. As one of the vice-presidents of the Association expressed it, "continuity of work gives double efficiency." During the autumn the garden was used as a general playground, and in December it was flooded and converted into a skating rink.

The public schools of Pittsburgh are under a decentralized system and each ward runs its own schools. Thus it happens that the Pittsburgh Playground Association receives an annual grant from the city to carry on its work, which includes schoolyard playgrounds, recreation park playgrounds, recreation centers (in summer, virtually vacation schools without their formalism), and the new department, established in 1909, of nature study and school gardening. Much attention is given to these two subjects. School gardens are to be located at each of the large recreation centers with their playgrounds, and in other suitable localities. A number are already well established. This is virtually social settlement work.

One feature of the nature study work in Pittsburgh is the tramps that the children take under experienced teachers. Any child may go on these. But the pleasure of handling his treasures and learning how to safely keep the things that he has brought home from such tramps, watching what will happen to cocoon or caterpillar, and the joy of naming, pressing, and mounting



PITTSBURGH CHILDREN ENJOYING THEIR SCHOOL GARDEN

specimens, with his comrades in the sunny room that is provided can only be earned by work on a small farm for the season. After all, farming is unpleasant only when it is very hot. So think many of the children as they join the farmer's squad. They have even been known to leave the nearby playground deserted, preferring the attraction of their gardens.

In order to have the children's work of the best, the conductors of the tramping excursions are picked and especially trained teachers. That the garden work may come up to the same standard of quality, winter courses in nature study, psychology and pedagogy for the normal students and for teachers have been arranged by an exchange of services between the director of nature study and school gardening of the Pittsburgh Playground Association and the professors of the University of Pittsburgh. The work inaugurated this year promises to send Pittsburgh to the front in school garden work along with Washington, Cleveland, Philadelphia and Yonkers. These four cities, in the individual character of their work, are doing on a large scale what many small communities are accomplishing elsewhere by faithful efforts along the same line.

Coming now to gardens carried on in connection with the regular school tuition, we find marked latitude in method and range, varying from voluntary work of children at recess and before and after school, under the guidance of their grade teachers, to regular teaching as a part of the curriculum and definite garden work in the classes through the year. Some illustrations may suggest an intelligent choice of method.

One city gives this example of school gardening and civic improvement. The children of several schools situated in a colored quarter volunteered for garden work, each room or grade making

itself responsible for the planting and care of ten little garden plots in the nearby backyards. The neighbors gave the ground, the children did the work and met the necessary expenses out of



Making the Most of a Small Space

their school fund which they had raised in various ways. Streets that had been scarcely more than alleys took on an orderly look; grass plots were trimmed,—even with a pair of old scissors

when there was no better means. Encouraged by their schoolmates' labor, the children and some of their elders planted a few small flower beds of their own. This city also set a squad of its school boys to work on a vacant lot, 70 x 150 feet, where they enjoyed growing a mixed crop, largely beans, for the local market. The experiment did them and the neighborhood good and all hoped that it would be repeated. In the same city one troop of school children made an excellent formal garden.

Excellent results were obtained in Cincinnati, where the Woman's Club has encouraged gardening among the school children, chiefly at their homes. It distributed seeds and hired one of the university students to give talks, inspect the children's home gardens (over 1000 in 1908), and to supervise the work at the Douglas School garden, Walnut Hills. The gardens varied in size from a reasonably large backyard vegetable patch to a window ledge of cans with growing plants or to a tiny space made by taking up a few bricks in the crowded and densely populated districts where tall apartment houses and tenements elbow each other. Many neighborhoods having gardens were much improved. The Douglas School garden, carried on throughout the summer by the colored children, collected from different parts of the city for this vacation school, is one of the brightest and trimmest and most satisfactory among the smaller gardens of

the country. It is located on two sides of its school, and on one side runs far back. Its flowers were massed in the front, while long lines of vegetables stretched away in the background. There were twelve rooms in the school and as in the spring, each class had planted and tended its own vegetable and flower plot,



The Douglas School Garden, Cincinnati

so in the summer time, each grade carried on the work, though with a different set of children. It showed good planting with sufficient uniformity and excellent results, and gave evidence of intelligent supervision and a recognition of those silent values that build character and develop a sense of citizenship. Its effect was

felt in the improvement of home premises. The gardens of several other neighborhoods could well compare with the much-praised improvements in those sections of Dayton influenced by the lesson of the Boys' Gardens of the National Cash Register Company of that town.

The utilization of a garden in connection with two schools of New York city illustrates what can be done when there is a will to make a way. In one case a 3½ foot border around a 90 foot playground was made by tearing out the concrete and carting in soil. The garden cost $80. It grew in the spring cosmos, beans, lettuce, beets, nasturtiums, radish and sweet alyssum; in the fall, one row each of daffodils and hyacinths and six of tulips were planted. Down town in Greenwich Avenue another small garden (see page 238) holds the interest of many little folks. Each grade and each division is represented by two young farmers who not only take care of their section in the garden but must be able to tell their classmates all about its growth. These lectures are supplemented by the nature-study teacher. Work in the garden is enjoyed by the drawing classes also.

New York has no school gardens officially recognized as a part of her school system. There are a few in connection with the vacation schools. DeWitt Clinton Park School Farm belongs to the municipal park system. Though it offers nature study material to nearby schools and ob-

servation practice to visiting classes, it is a summer garden in that the greater part of its work is done, as has been said, during the vacation months. Many of the school teachers of Greater



CONQUERING DIFFICULTIES, P. S. 41, MANHATTAN,* NEW YORK CITY

New York are firm believers in the gospel of the school garden and to further it have formed The

* In sections of the oval, the children raised peas, carrots and beans bordered by dwarf nasturtiums; lettuce and zinnias; balsam and radishes (the flowers blooming after the vegetables were gone); and one section of potatoes.

In the border, the gardeners of the different grades raised daffodils, narcissus, hyacinth together with cypress and madeira vine; pansies, dwarf nasturtiums, sweet alyssum and scarlet runner bean; a rhubarb plant, a seedling oak and maple, a hydrangea, iris, marigold, zinnia and wild aster; day lilies, violets, lily of the valley, radishes and zinnia; while the sixth grade had a wild flower plot.

School Garden Association of New York, with a membership of 1000. Their first annual report in the spring of 1909 showed over 80 school gardens carried on by the voluntary efforts of these public school teachers.

The gardens just described are but loosely connected with the school life. Philadelphia, by contrast, correlates the garden work with that of the school "from the kindergarten to



School Garden and Arsenal Park, Pittsburgh, Pa.

the senior class of the normal." During the school term, the classes from the kindergarten to the fourth grade inclusive visit the garden during school hours. There they have a talk of fifteen or twenty minutes, and then, on the class plots, put into practice what they have heard, observing and working the rest of the period. The talks or lessons are progressive through these grades as are those for the individual plot holders

who come from the fifth, sixth and seventh grades to work in the garden after school from three-thirty to five o'clock. These last are children who ask to be farmers. At the end of the school year they surrender their plots to a new set of children who possess them during the summer, during which time the class plots become sample plots. The correlation of the garden work is left to the grade teachers. The summer lessons are distinct from those of term time and are also progressive. A summer's day is divided as follows:

8.00–8.20 A. M. Nature study lesson.

8.20–9.30 A. M. Individual plot work.

9.30–10.00 A. M. Work on borders and sample plots.

The vacation classes are large and come three times each week, being subdivided into two sections, A and B. The B section follows A and repeats the program from 10 to 12 A. M. The last half hour of the session is reserved for the teachers for the inspection and clerical work that ends the day.

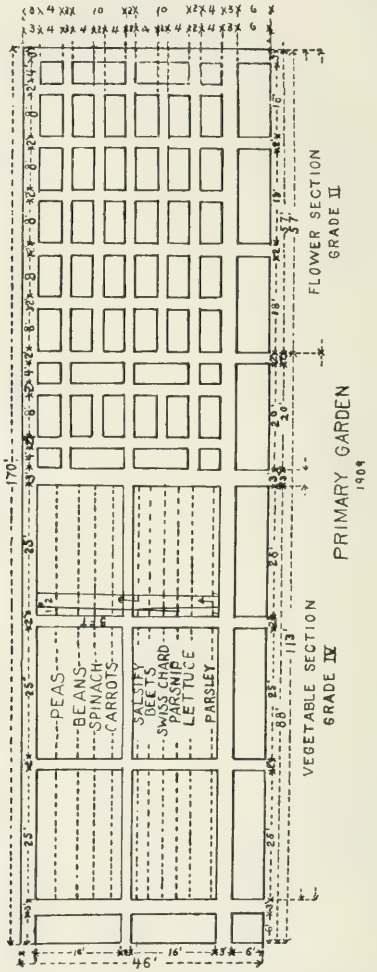
In Cleveland, the bond between garden and school is looser, while in Washington the garden work is minutely defined in every grade and each child has as regular work allotted to him in the garden, as in arithmetic or other studies.

At the Whittier School of Hampton Institute (see footnote, page 21) the garden is closely associated with the work in nature study and drawing. Here, as in some other schools, exercises

consist of cutting silhouettes of garden tools and picturing little gardens by clippings from florists' catalogues. Strings and necklaces of seeds, seed pictures and twig stories, as well as furniture made of burdock burs, allow the children's hands to work out their own ideas. School-garden work of the same character must not be repeated through the grades. It must be adapted to the age and the experience of the children. This may be accomplished in several ways.

An eastern Normal School, Hyannis, Mass., in its six years of school life offers gardening to the children practically during three years of the course, each being a full garden year. The school garden course takes its place in the spring in the second, fourth and eighth grades and in the fall in the third, fifth and ninth. Dr. W. A. Baldwin considers that the natural standpoint from which to view the school garden is as a farm that is to minister to human needs. Consequently, it is best seen in connection with a home. In such a garden each child performs his own labor and enjoys the fruit of that labor. At the garden in Hyannis every effort is made to conform to this idea. In the laying out of the vegetable beds of the fourth grade, it is planned to make the individual plots in long continuous rows of about twenty-five feet so that the general appearance would be that of a garden on an ordinary farm or on the child's home lot. Indeed, he is expected, with the co-operation of his parents, to

reproduce his school garden at home, on a larger scale.



Plan of Hyannis Garden

With little children there must be a close resemblance of form, for individual initiative is not, as yet, developed. The child must have in his home about the same tools and plans to work with that he has in the school garden, or he will fail to carry his knowledge from one to the other. But in the second grade, work is confined to the child's innate love of digging and to calling his attention to the major differences in form, color and growth of the simplest flowers of which he may become the owner. These are selected by color and the garden is planned for color masses. A little later he is to grow his plants not for himself alone but to share fruit or flower with his home people. In the fourth grade he has chiefly vegetables, and is taught to harvest them and take them home in good condition to his mother. In this year's work he is expected to market enough of his crop to pay for his seeds. In the eighth and ninth grades the children are expected to pay all expenses from the returns. In these grades also, they are expected to plan their work, map out its details, arrange for plowing and fertilizing, do the planting, market the produce and carry on in the school all those necessary operations of accounts and banking that the up-to-date farmer would meet in converting his seed into crops and these into his bank account. The children have practical problems in arithmetic and in surveying; practice work in cooking; exercises in English based upon their garden;

instruction in drawing, and in making garden accessories in the manual training department.

In the management of the garden and of the necessary money, the class fund, garden club, and parliamentary debate find a place. Here the commercial basis is a natural one because as the work is done by the children these different problems arise and their solution becomes of vital importance to them. In connection with these, the child's relation to his mates gives opportunity for the study of ethical questions and for a well-rounded development. School gardening is not dragged into each school exercise of every day, but for the few weeks in spring and fall of the years in which it occurs it is made the center of the school activities.

The State Normal University at Normal, Illinois, with its school garden of two and one-fourth acres, its 4 x 10 foot plots, and areas for field-crops, corn and fruits, conducts its work somewhat differently. The crops grown by the children are not theirs. They are grown for the nature study, art, or domestic science departments of the normal school. In the intermediate grades the children are required to have home gardens and to report their condition and bring samples of their produce. In this way home and school are connected. The use of the garden grows with the child's development through the eight grades. Here is one of the best illustrations of the value of the school garden to enrich

school life from the kindergarten until and after the children take up elementary agriculture.

"The scope of our work expands with the age of the pupils. . . . The upper-grade students and students in the normal department make the garden auxiliary to their science work. . . . Few individual plots are assigned in the school garden. We have arranged, however, to use for



Sixth Grade Pupils Budding Peaches, Normal, Ill.

individual plots this season with the seventh, eighth, ninth and tenth grade children a portion of our university farm of 95 acres lying just across the road from the school garden. The land will be laid off in strips of 100 feet wide with paths. The land in these strips will be rented to the students at 2 cents per front foot ($8.70 per acre). No pupil may rent more than one-fourth

acre. The land will be ploughed and harrowed for the boys and we expect most of it to be put into corn. . . . We are about to extend our garden work now to our farm which heretofore has been leased, and in the next few years hope to have as successful practical work in agriculture and horticulture as is found anywhere in our country."*

Beginning in the spring of the first year, seeds are planted in egg shells to take home or to transplant into the school garden. Seeds of the four-o'clock, the nasturtium, radish, lettuce, and beans, are planted by these little children. Smaller and finer seeds, more varied plants and more comprehensive work are subjects taken up as the child advances. In the third grade there are simple exercises in germination and plant growth, in the comparison and selection of seed. This grade does some work with simple cuttings, while a more extended study of them is deferred to the seventh. The work each spring is in large measure a preparation for that of the fall, as in slightly less degree the fall work is a preparation for the spring. The gathering of seeds, their storing, and some of the winter work in the greenhouse where the children pot, plant seedlings, and, as they are old enough, learn the process of budding and grafting, are of especial value.

The children of the fourth grade study bulbs,

* Letter of President David Felmley, January 31, 1910.

tubers and roots as well as seeds, as an illustration of the means by which plants increase. In the fifth grade they study the life history of a plant; as for example the beet—a biennial—while the sixth learn to make and use a cold frame. They also make a careful study of the cabbage family.

In the upper grades, well defined color schemes of planting are worked out, and experiments of varied character with different crops and fertilizers, etc. The boys take the farm problems and the girls the æsthetic. The school plan calls for certain work to be done at the same time in the home gardens and thus strengthens the children's interest by winning their parents. The whole plan of the garden is most attractive; the flower section, about half an acre in extent, is massed to the front. The waving grains, vegetables, nurseries, graperies and experimental plots are at the rear.

Some schools begin growing plants for nature study and develop a garden as "the pivot around which the course of study revolves." The work through the school year is done by the regular instructors who spend one hour each week in the garden. The summer work may have a special instructor for half of each day.

We give in the compositions that follow two illustrations of the correlation of garden and language work.

Corn

Corn belongs to the grass family, the stalk is jointed, and the leaves and ears grow from the joints. It grows from eighteen inches to thirty feet high.

There are four kinds of corn that grow in Minnesota. They are Dent Flint, Sweet and popcorn.



Child with Grain

Corn is planted in hills about three feet eight inches apart, when the weather is warm enough. It needs rich loam, and warm, wet weather to grow well.

Corn is used in feeding stock and making glucose and oil. Alcohol is also made from it. We make corn-meal and other foods that people eat.

It must be cultivated very carefully, so the weeds will not grow. It must be harvested before frost comes.

There are about two million bushels of corn raised in the United States every year. Corn is a native of Mexico.

The Indians used it for food when America was discovered. They buried it in the ground to keep it. Maize is another name for it. Goldie Kelly. B5.

Cruciform Family

We all planted some member of this family. We sold dozens of radishes from our beds. We planted the cabbage turnip kale and candy tuft. We know this family because its flower is the shape of a cross. One little girl sold forty dozen radishes one morning.

Mildred Anderson B3.

Correlation of arithmetic and gardening work is illustrated in the following account:

Northrup, King & Co.,
26, 28, 30 and 32 Hennepin Ave.,
Minneapolis, Minn., 5|22|09.

Sold to Maple Hill School Garden
Ship to Pierce School
Address City
Ship via Call

25	Capt. Jack Strawberry Plants..	$0 50
1	3 yr. old Wealthy apple tree ...	40
10	Raspberries Red.....	60
5	Black Cap.....	50
5	Blackberries Ancient Briton....	50
	The LaFrance Set Roses.....	33
1	Baby Rambler	12
1	Minnesota Sorghum.....	10
1	Broom Corn	10
50	Asparagus Roots 2 yrs	60
75	Celery plants	75
1 doz.	Zyrian Rose Phlox.....	1 50
	Castor Oil Bean.....	5
2 pkts.	Scarlet Sage	10
		$6 15

Elmer Anderson A8.

To avoid overlapping of work, a school that uses a garden for group work almost entirely gives its kindergarten children several kinds of seeds to plant and watch grow. The first grade had radishes and nasturtiums; the second lettuce and zinnias; the third had in the fall indoor bulb planting and in the spring (the garden season was April to June and September to October) the planting of onions, peanuts and beans. The children of this grade also made a study of some flower, planting it as one member of a group or family. As the children ranged from five to sixteen years in age, the fourth grade added transplanting to their work, and took up, in the experimental plots, the study of corn, wheat and oats. In the fifth grade cotton, hemp and flax were grown to illustrate their lessons in geography, while the sixth worked with tree seedlings, the seventh with a wildflower bed and made simple experiments with vegetables. The eighth took care of a decorative border on this 200 x 25 foot garden, growing both annuals and perennials.* This school had 500 home gardeners among its 600 children.

Variety of work may be secured by studying the same subject from different points of view. An exhaustive study of a plant is not suitable for the lower grades. How corn grows and its conversion into flour is interesting to young children. Its pollination is a good study for several grades,

* Carroll Robbins School, Trenton, N. J.



135 x 40 feet

FORMAL GARDEN MADE BY THE CHILDREN OF SCHOOL NO. 10, INDIANAPOLIS

but its place as an economic grain in the world's markets should come after some idea of geography, of material resources, and of the inter-relation of men and states has been obtained.

Another method is to use plants to illustrate hygiene in the sixth grade and physics in the seventh, adding in the eighth specialized studies of the relations of plants and of their historic and commercial value.

From these illustrations some generalizations as to the adaptability of school gardening to the different grades may be drawn. Children below the fifth or even the sixth grade require very simple garden operations unless they have been gradually led up to the handling of fine seed and the care of delicate plants. In small groups, they will do well working together on class plots,—do better gardening work, unless there is ample time and the competent and thorough supervision given to the individual plot culture which is always the desideratum. Kindergarten children can be effectively managed if each step of bulb or seed planting is taken separately and required to be completed by all before the class passes to the next. Much of it, like the dropping of seed and the placing of bulbs, can be done by the class in military file. If a long straight board is used to place over the freshly covered seeds, the children marching on it may firm them down. The same board may be used for the children to stand on while making their furrows along its edge and while

dropping the seed, and so save a great deal of trampling on the little gardens and some soiling of shoes and clothes.

Little children should be given garden lessons that deal with big seeds, bright colors and a few of the very familiar and easily grown sturdy plants. Their plots may vary from 2 x 2 feet to 4 x 8 feet or they may each have very short



First Grade Children Learning the Names of the Flowers, Pueblo, Col.

strips of the class plot put under their special care and watchfulness. Children from the sixth grade up to fourteen years ought to have at least 4 x 8 feet beds, better still 5 x 10 feet and the quicker or more experienced 10 x 15 to 10 x 20 feet. The latter size is a little large for one hour per week of cultivation, but when a child may have more time, though but once a week, such a plot can be

well cared for. The 10 x 15 feet is believed by many experienced teachers to be fully as large as the average child under fourteen can well manage in the one, two or three periods per week usually required.

The size of the individual plot, aside from consideration of the area of the garden and the age of the child, should be determined in part by the



DeWitt Clinton Park School Garden, New York

character of the work planned and by the quantity of produce that will make gardening seem worth while to the child, or even, in some places, to the parents. They may in the summer time prefer to have the children work at home or elsewhere for a mere pittance in cash or even to gather coal from the ash dump. Small plots will yield from $2.50 to $5.00 worth of vegetables, not otherwise obtainable by many poor families, and, if sold to

the home folks or neighbors, or at the market, are an inducement to boys of well-to-do families to sustained efforts in order to increase their spending money or show what they can do. In the school term, gardening is frequently offered in the fifth, sixth and seventh grades and not in the eighth, as there the children are often over-busy preparing to meet the requirements necessary to pass to the high school. Moreover, a large number of children leave the schools about this grade, and gardening should be taught them as soon as they can readily handle the tools if they are to learn enough of it to practice it for pleasure or to eke out a livelihood.

Allied to the school, the advantages that garden work offers may be considered under eleven heads:

(1) The school garden is the source of the best nature study material, intimately associated with the child's daily life and which through ownership of an individual plot may be one center of his childish interests. The use of its materials may be directed by the nature study course required by the school authorities, or it may consist of any systematized treatment sufficient to cover the special interest that the hour may bring. Whatever the aim, the period should be as free as possible from the exactions of routine work. The child should feel his freedom and rejoice in it, think and see for himself, and freely speak of his observations and his conclusions. He should be led to self-conviction of any that are erroneous. Where it is possible to give the

child his choice of seeds, it should be done either from a limited list that seems large to him or so freely that he may be told that he is to plant anything he likes unless upon discussion he sees his choice to be unwise and voluntarily relinquishes it. The following is a good list from which selection may be made:

VEGETABLES *	FLOWERS
String Bean	Phlox
String Bean, Wax	Zinnia
Radish	Aster
Lettuce	Coxcomb
Lettuce Plants	China Pinks
Beet	Calendula
Swiss Chard	Nasturtium
Onion	
Onion Sets	
Parsnip	
Turnip	
Celery Plants	
Carrot	
Parsley	
Peas	

The child should have an opportunity for complete self-expression. Whatever his leading motive in his garden work it should be respected; should, if necessary, be toned down (if the motive be greed for gain or self interest of an unworthy kind); should be guided, and used to open his mind to other relations than those he at first sees.

* Fairview Garden list.

(2) The school garden in art work provides problems in design, color, form, grouping and composition; and studies of raw materials, such as stuffs, dyes and paints.

(3) The school garden suggests topics for language work whether in composition, spelling or writing. It teaches appreciation of the best literature and makes intelligible many of the references in metaphor, and parable. It enriches the child's mind by bringing to his notice some of the best stories, essays, and poems that have been written.

(4) The school garden, in mathematical studies, gives reality to principles which, except to the mathematical mind, are vague and difficult to grasp. It offers opportunities for practical work in number, in elementary geometry, in surveying, in all kinds of measuring and for many computations whether of the farm, the shop or the bank. The solution of each of these problems carries the child a step in advance and, unsolved, they halt and baffle him in doing those things in which he is vitally concerned.

(5) The school garden in physics and chemistry also requires problems of number as well as explanations of the natural forces and the laws by which they govern the life or affect the labor that belongs to the plant world.

(6) The school garden associates itself with household or domestic science as the provider of the raw material of food and textiles, and suggests

the large relations of each whether geographical, industrial, economic or social.

(7) In history the school garden has a less prominent place, but it may be made to contribute interest, if its plants have a story that connects them with an old custom, the development of the world's trade routes, the industrial importance of nations or with the wars that they precipitated.

(8) The school garden is industrial training.

(9) The school garden in manual training offers a motive for making things for the garden, and teaches helpfulness and economy by saving money through the repair of tools and the making of many garden accessories.*

(10) The school garden, whether conducted on a small or a large scale, is elementary agriculture. During the years when each child is asking about everything he meets, the three questions, What is it? What is it good for? Why is it? the garden will hold his interest and serve as a concrete answer when the teacher finds it impossible to make ideas clear by words. It seems almost criminal to let the child's curiosity go unanswered until it develops into indifference to his surroundings or into an increasing dislike of them because he feels their monotony or drudgery. Apart

* Shrub, plant and pot label, cultivating stick, line and stakes, cord winder, trellis (of different forms), flower-pot stand, garden bench, sundial, barometer, weather vane, rain gauge, flats for seeds, root cages, spreading boards and insect boxes, and even bird boxes may be made.

from the question of agriculture, many a school boy has found his best development through the motor activities released and the motives of action satisfied in the school garden. He may be a dullard or a laggard at his books, perhaps unsocial or unattractive in his personality. Let him have a chance to vent his feelings by work, or satisfy his dormant æsthetic, or emotional,



Fourth Grade Children Cutting Grain—Lakeview School, Pueblo

nature through care of his plants. If he makes any kind of a success of his garden, his self respect is restored and he finds his place among his fellows.

(11) The school garden improves the school by creating a strong social bond among the pupils and between the school and the parents as the home gardens develop. Here very often morals

and civics have a more natural place than in the prescribed school period for these studies. Finally the school garden's call to study things rather than books, to motor as well as intellectual activity, follows the cry of all educational reformers. It answers the present day appeal for an education that will educate for everyday living; and supplies in miniature the conditions which the child will soon be called upon to meet. Thus armed to confront prejudice and to conquer by its worth, friends of the school garden confidently expect its numbers to increase.

CHAPTER IX

SOME LAST THINGS



A HAPPY CROWD OF HARVESTERS

CHAPTER IX

SOME LAST THINGS

"The man who has planted a garden feels that he has done something for the good of the world. He belongs to the producers. It is a pleasure to eat of the fruit of one's toil, if it be nothing more than a head of lettuce or an ear of corn."—Charles Dudley Warner.

A TIME comes in every garden, carried on through the summer months, when interest flags. Usually this happens in August. The first joyous sense of proprietorship has quieted down into a full assurance of ownership of crops that are rapidly maturing. The weeds have been pretty thoroughly discouraged or the plants seem sturdy enough to hold their own against them. The daily harvest may be offering only slight returns outside of the now familiar supply of greens, like Swiss chard, or pickings of late sown radish and lettuce. It is still too early to plan for the day when the little farmers will present their exhibits at a county fair, a harvest home, or the annual fête that should close the growing season of the garden. It is the time when heat makes every one sluggish and when the swimming pool is especially dear; when ball games and picnics are being planned by parents and children because

the summer is passing and vacation will soon be over.

Then it is that teachers have anxious hours lest the children's interest fail; then brother or sister, cousin, friend or neighbor instead of the unpunctual owner appears with the words, "Please where is Benny's garden? I want to pick the stuff." And further explanation of the absent one's non-appearance follows which may or may not be convincing. The stranger goes to work energetically with the surety of quick return for labor—for is not the harvest at hand? He is probably found doing exasperating and forbidden things, and his lack of experience and skill has to be guarded against. Moreover, why should he not pick the vegetables first and make sure of his pay for any amount of labor he may put upon the little patch before the unusual effort in the sun fags him? The other children have been trained to the habit of first work, then pay, the cultivation of the plot and then its harvest, for that is the rule of the garden that ensures systematized work, easy supervision and an attractive appearance in which all may take a pride as the result of their joint labor.

When the children's interest flags, a gala time should be planned to break the usual routine and to compete with the less profitable excitements that are pulling the children away from "organized recreation,"—as one garden calls its work. But in those gala days the children should be

as much a conscious factor as in any holiday outing.

If the children have become familiar with flower, plant, weed and insect, with soil and the way it is made from rock, a field excursion may be planned to some good exploring ground, or better still combined, if possible, with a visit to some historical site. A few playmates as guests of the entire company increase the delight with which the children enjoy making "finds" and explaining them. Apart from this counter attraction outside the garden, there are others for which more active preparation will be needed. By fête days, exhibitions and harvest homes the children testify to the value of school gardening, offering as evidence the work of their hands, the output of their gardens, and carefully worked out plans to entertain their guests. They like so well to do the latter that it is best to have several children at a time take turns in acting as guides to visitors to the garden. This gives a fine opportunity to develop courtesy.

Not alone by their garden festivities do the children show their approval of the school garden. There are times when hard work unaccompanied by prizes and plaudits is their testimony. Good crops show careful preparation of soil and cultivation, but do not necessarily tell how much child labor and earnestness have gone into them. In one city, the children cleared off seventeen loads of rubbish in order to start their garden.

In a hot southern town, boys dug two 6 x 12 foot holes to a depth of 2 feet and brought good soil from a distance to fill them. On these two beds, they grew beans, onions, lettuce and radishes so successfully that the board of education purchased a lot in which they were offered 11 square yards for a garden. The plot was almost a plantation of rocks. The lads, however, worked until they had removed all and had sifted the soil for the garden. The following Saturday fifteen boys worked all day, some going dinnerless, to get their garden ready for planting. A group of Philadelphia mill girls spend their noon hour in the garden. Children of the Seward School, Rochester, have gradually developed a good scheme of school ground decoration from the native material on the large open lot next the school house. This is partially swampy, and has supplied willows, ailanthus, elderberry, dogwood and thorn apple for transplanting. Vines also were obtained. Where temptation existed for pupils to lean against shrubbery or to cut across the lawn, they decided to plant a young thorn bush. Their lawn was sown with grass seed sifted from the dust of their fathers' hay mows.

A child gets profit and pleasure out of the garden in direct proportion as he puts himself into it, and inversely as the teacher does his work for him. It is so much easier, under the guise of showing a child how to use his tools, to do most of the work on the small farms. The teacher never, after the first lessons, should take the



PHILADELPHIA MILL GIRL GARDENERS

child's tools into her hands a moment longer than is required to show the correct hold and sweep in working. That many are heart and soul in their work is evident. Two boys astonished parents and teachers by appearing regularly at the garden, a mile or more from their homes and laboring steadily and faithfully over their plots when they had never before been known willingly to do any kind of work. One of them persisted in spite of a bad attack of ivy poisoning. Two small colored boys appeared in the office of the industrial school which they were attending and begged to be promoted from their 4 x 8 foot plots to the farm squad. They had discovered pleasure where many find only drudgery. The boy who for four years got up often with the sun, walked three miles to the Hartford School of Horticulture, did his own work and hung around all day begging for jobs, was at seventeen ready to begin the slow reconstruction of a run-down farm that his father bought for him near the city and to which the family of six removed. One small girl was so determined to have a garden that she utilized old cooking utensils as hanging baskets and suspended them from lines which she willingly took down once a week because they interfered with her mother's washing day. There are stories innumerable—real ones—often mirth provoking, often pathetic, often full of courage and conquering persistence.

Children frequently express convictions of their

own about school gardens.* A little Cleveland girl confided to her teacher, "I did not have St. Vitus dance this summer, nor last, since I have worked in the school garden."



A Member of the "City Beautiful Club," Louisville

A helpless cripple, dragging about on hands and knees, thought he had found heaven when he discovered the pleasure there was in growing

*Some convincing opinions of educators may be found in Appendix B, page 321.

flowers. "Here I have found a joy in life," he said. Later, as his infirmity grew upon him, he learned to note the habits of insects and then to mount them so well that he became self-supporting by the work. Children who start home gardens frequently become enthusiasts. One eleven-year-old boy would allow no one else to pick a single flower in his garden, but he daily provided each member of his family with one of his treasures. When two boys from three stocks of rhubarb got enough for their mother to make "many pies and thirty-three glasses of jelly and five quarts of rhubarb preserves" they felt satisfied; they were proud because they had a goodly yield of other vegetables, including ten bushels of tomatoes from fifteen vines on a 10 x 12 foot plot. When a certain school garden had to be closed, 228 requests came asking that another might be opened. Numbers of girls and boys, through the garden have found the work they want to do in life and have set themselves to mastering its details. One child in her composition is spokesman for many:

WHY DO I LIKE TO WORK IN THE SCHOOL GARDEN

We have great fun at the school garden every morning about eight o'clock.

We enjoy the sun-shine and we don't mind if it rains because it makes the plants grow.

I like to make and plant the beds and see the things come up.

I like the sweet-peas the best because it makes a pretty bouquet and is so fragrant.

We learned they belong to the pulse family, a very useful family to us and the soil. We have learned that peas and beans contain a proteid and carbohydrates for our food and that they make nitrogen for the soil to make it rich to grow wheat and apples.

I like to get the enemies out of the garden. We have pulled thousands of weeds from the [garden].

Eva Soderberg. B6. Age 12 yr.

The children of the very poor find working in a garden preferable to sorting at the public dump, hunting greens or minding babies at home. They prefer to bring the little ones to the garden and interest them in big brother's crops even to the point where little brother helps. One lad, not to be outdone, appeared one day with a borrowed child, saying stoutly, "every other fellow had a kid." The girls like mothering the children where there are bright flowers and fresh air and a shelter from the summer heat, finding the garden a great improvement over the close tenement or crowded doorstep. The gardeners also like the commercial side of their work, whether it comprises only the sale of 15 quarts of beans to an Italian eating house or $25 worth of produce, such as the 10 x 90 foot plots sometimes yield. They like the money for necessities or for pleasures, and best of all, for that most excellent abiding sense of power and self support that it brings.

It is a happy time for the little farmers when the products of the cherished plot weighed or measured, the results entered upon the day's diary, are finally packed in basket, cart, or bag, and taken home to be carefully cared for until eaten. All this the children usually enjoy. Unless there is



A Welcome Guest at Fairview

space to encourage games and play in the garden, the time when the daily harvest is cared for becomes its social hour. Unconsciously, it is the practice period in training the judgment to an appreciation of standard vegetables, to a better understanding in the future of the rules and regulations laid down for competitive exhibits and

prize collections. An occasional word from the instructor is the lead which will be followed by children as they compare size, color, conformity to standard type, appearance of vitality and the desirable characteristics to be promoted by careful selection of seed; as they contrast the weight or measure of their respective crops, the carefulness with which the produce is cleansed or



Our Pumpkins—Lakeview School, Pueblo, Col.

bunched, and its attractiveness when ready for home or market.

If bunched, flowers and vegetables should be securely tied, but so loosely as not to look choked. A practical object lesson in the æsthetic value of grouping a few flowers, or in the beauty of a single blossom, together with some suggestions of the relation of color and form, or hints as to the appropriateness of the receptacle which holds them,



EXHIBIT OF VEGETABLES RAISED BY SCHOOL CHILDEN, LOUISVILLE, KY.

should be given sometimes, even if there be no insistence upon the children's following the suggestions. Whether they do, or not, will depend in some measure upon the class of children and their homes. A single flower in a bottle may be more beautiful than a tight bunch in a vase. Again, the lesson in hygiene may be taught, not from the standpoint of how cut flowers must be cared for, to prevent the slime and bad smell of decaying stem leafage, but from the desire to have the precious flowers keep fresh as long as possible, and the knowledge that clean-stripped stems will help to this end.

The illustrations opposite pages 265, 187 and 273 show what children can do in the way of harvesting and making exhibits. The first gives a group of about 70 boys, or a little less than a fourth of the lads in that particular garden. The girls are not included because the photograph was taken before 1909, at which time the garden was doubled in size and the same number of girls admitted. The second illustration shows flowers, while the one opposite this page shows the vegetables raised by boys and girls in a number of school yards, small vacant lots and home grounds.

The exhibits at the Annual Exhibition of Children's Gardens given in Boston by the Massachusetts Horticultural Society prove that the sum of $150 yearly distributed in prizes is well earned by the school children of the Bay State. The western

states at town, county and state fairs call upon their children to make these occasions successful affairs and are loyally answered. In the Bowery district of New York, in the crowded Bohemian quarter of a western city, in rural schools, and from city back gardens, children respond to the call for a flower show or harvest home. One school garden in the foreign section of a large city has for several years taken first prize against all competitors. In another school the noise of the street was left behind, as issuing from a dark hall-way the visitor sauntered through aisles made by green branches of shrubs and trees brought from the nature tramps near Greater New York. Here could be seen creditable flowers and vegetables raised by indefatigable children in a tiny school garden plot; also a few butterflies and their breeding cages; a wasps' nest brought from the country; a bit of aquarian and swamp life; and a collection of native and foreign nuts. These were concisely, often drolly, ticketed by the children themselves with explanatory label or paragraph. Much of this work belonged in the nature study course of the school, but the little garden had given greater zest and understanding to it. There is another city school which numbers 2400 pupils, almost all from within two city blocks, and all from within five, where careful systematic questioning brought out the fact that only a thousand had ever seen a tree. To these children, a school garden was given for the two seasons

between the tearing down of an old building and the building of a new. The garden made clear to them what seeds and plants really do, and, one season, a hen and five little chicks were an added source of wonder and delight.

It is possible to overemphasize the requirement that a school garden should show excellent results in gardening. But the truth that the development of the child is more important than the successful cultivation of the plants is one that may defeat itself in large measure if we fail to remember two things; one, that the opportunity to have any school garden at all another year may depend upon the attitude of those who see it from a utilitarian or æsthetic standpoint; and another, that a goodly number of the qualities and habits which the school garden is to cultivate in the child are not taught by untidiness, carelessness, sickly-looking plants, spindling harvests and their consequent discouraging effect upon the child. Kept within limitations of size in area, of suitability in plants and of the right amount of labor among children, any garden should present a reasonable appearance of success and owes it to the neighborhood and to the children to do so. An intelligent supervision that will compel a high standard of excellence is of the first importance. So shall new school garden ventures be encouraged, difficult ones made to seem worth while, the beauty of well ordered life and the interrelation of its laws be made more apparent to the minds of children while they spend fruitful hours in the enjoyment of their gardens.

APPENDICES

APPENDIX A

NOTE 1, PAGE 8

There had been gardens as schools of horticulture for boys of noble birth, as in Persia, in ancient times. But during the Middle Ages, love of beauty and curiosity rather than a love for accurate knowledge, led the Italians to gather into gardens the new and curious plants which travelers, at the time of the revival of learning, began to bring into Italy from all parts of Europe and Asia (later from America); to plant those mediæval "observation plots" of which today the Island of Isola Bella in Lake Maggiore is an excellent example, where the tall cedars of Lebanon still flourish as when brought from their native Syria. The thirst for knowledge that seized upon Italy increased the number of horticulturists and embryo botanists. In 1525, a wealthy nobleman, one Gaspar de Gabriel, laid out a botanical garden on a large scale in Tuscany, and, within a comparatively few decades, all the leading cities of Italy and also many of the universities of France and Spain followed this example. Among the scholars visiting the universities, there were a few who had a definite and earnest purpose in the use of the gardens. They desired a scientific substructure for the crude and chaotic mass of facts, observations and records then called botany. But the general interest in the mediæval "observation

plots" was comparable to that of children's delight over some odd flower or leaf and their satisfaction at being told its purpose for use or ornament. It is a fact that the celebrated Jardin des Plantes, founded in Paris in 1626, was established for no better purpose than the expressed intention of furnishing new motifs, new floral designs for the embroideries upon the coats and gowns to be worn at the sumptuous court of the Medici. For this purpose, the Jesuit Fathers in far away Canada and the Mississippi valley, were bidden to make a careful report of the flowers they met, and, when possible, to send specimens to France.

About the beginning of the seventeenth century, the German universities started their botanical gardens and began the earnest search for a few underlying principles that should bind together all the seemingly unrelated forms in the vegetable kingdom. In 1735 Linnæus, the father of modern botany and of the Linnean "artificial system" of classifying plants, a system in use for many years,* in his "Systema Naturae" framed the first rough chart and forged the key to the mysteries of flower and fruit and growing things. A little later, in 1789, De Jussien in his "Genera of Plants According to Natural Orders" founded the botanical system in use today.

Broadly speaking, agricultural knowledge was differentiated by the university into botany or medicine both of which were taught within its walls, and into practical farming, carried on by the monks and peasants.

* Loudon's Encyclopedia of Plants, published by Longmans, Green & Co., London, 1880, a volume of over a thousand pages and several thousand cuts, has its first section arranged after the Linnean system.

To the learned, botany was a studious pleasure; to the monk, the tilling of the ground was a worthy humiliation. Thus, to the average mind, agriculture was a necessary labor but fitted only for monks, slaves and peasants. Yet, as early as 1695, August Francke of Halle, Germany, discerned the educational value of a garden in connection with his orphanage. He was far ahead of his time. For many generations the educative value of garden work for children was regarded as the idle prating of philanthropists and educators like Salzman and Comenius, like Rousseau and Pestalozzi. The last named gave a concrete example of its worth by insisting upon field and garden practice as a part of his boys' and girls' daily tasks. Froebel founding his kindergarten in 1840, advised gardens "as a true school of happy occupations."

NOTE 2, PAGE 18

Any Rural School Board or any School Board in a village that shall (1) provide a school garden of at least one-quarter of an acre in addition to the regular school ground area, adjacent to or convenient to the school; that shall (2) provide the necessary tools, implements and other requisites, and shelter for them; and also (3) one legally qualified teacher, shall be entitled to an initial grant not exceeding one hundred dollars, and a subsequent grant of twenty dollars out of any grant made for Elementary Agriculture and Horticulture by the Legislature, to be "expended in caring for such School Gardens, and for keeping the school grounds in proper condition." "Should the sum voted by the Legislature not be sufficient to pay in full the grants on the foregoing basis, the Educational Department

will make a pro rata distribution on the sum voted." If the instruction given be approved by the Inspector, said instructor shall be entitled in addition to the regular salary to a grant of $30 per year. (Circular No. 13, July, 1909, issued by the Legislative Assembly of Ontario, p. 5.)

NOTE 3, PAGE 58

BOTANICAL GARDEN*

ROSEDALE SCHOOL GARDEN, CLEVELAND, OHIO, 1907

Spermatophytes

Angiosperms

Monocotyledons

Order	*Family*	*Order*	*Family*
Gramineæ	Grass	Smilaceæ	Smilax
Cyperaceæ	Sedge	Amarillidaceæ	Amarillis
Araceæ	Arum	Iridaceæ	Iris
Liliaceæ	Lily	Orchidaceæ	Orchid
Convallariaceæ	Lily of the Valley		

Dicotyledons

Order	*Family*	*Order*	*Family*
Urticaceæ	Nettle	Papaveraceæ	Poppy
Aristolochiaceæ	Birthwort	Cruciferæ	Mustard
Polygonaceæ	Buckwheat	Resedaceæ	Mignonette
Chenopodiaceæ	Goosefoot	Sarraceniaceæ	Pitcher Plant
Amarantaceæ	Amaranth	Droseraceæ	Sundew
Phytolaccaceæ	Pokeweed	Crassulaceæ	Orpine
Nyctaginaceæ	Four-o'clock	Saxifragaceæ	Saxifrage
Portulacaceæ	Purslane	Rosaceæ	Rose
Caryophyllaceæ	Pink	Leguminosæ	Mimosa
Ranunculaceæ	Crowfoot		Senna
Berberidaceæ	Barberry		Pea

* Notice how all these families can be shown by typical plants that are common enough to be within easy reach.

Vegetable garden at Rosedale teaches succession of crops; flower garden orderly arrangement, harmonious color effects and succession of bloom; botanical, plant families and economic significance.

List by courtesy of Miss Louise Klein Miller.

Order	*Family*
Geraniaceæ	Geranium, Wood-sorrel, Jewel-weed
Linaceæ	Flax
Polygalaceæ	Milkwort
Euphorbiaceæ	Spurge
Malvaceæ	Mallow
Hypericaceæ	St. John's Wort
Violaceæ	Violet
Cactaceæ	Cactus
Lythraceæ	Loosestrife
Onagraceæ	Evening Primrose
Araliaceæ	Ginseng
Umbelliferæ	Carrot
Primulaceæ	Primrose
Gentianaceæ	Gentian
Apocynaceæ	Dogbane
Asclepiadaceæ	Milkweed
Convolvulaceæ	Morning Glory
Polemoniaceæ	Phlox
Boraginaceæ	Borage
Verbenaceæ	Verbena
Labiatæ	Mint
Solanaceæ	Nightshade
Scrophulariaceæ	Figwort
Bignoniaceæ	Trumpet Creeper
Plantaginaceæ	Plantain
Rubiaceæ	Madder
Valerianaceæ	Valerian
Dipsaceæ	Teasel
Cucurbitaceæ	Gourd
Campanulaceæ	Bellflower
Compositæ	Chicory, Ragweed, Thistle

NOTE 4, PAGE 71

A seed grain competition was carried on by boys on farms all over Canada from the Atlantic to the Pacific. The main purpose was to improve crops by the use of seed improved by selection. Dr. Robertson will best tell the story:

"In the summer of 1899 I put aside $100—my own money, not public funds—to offer in prizes to Canadian boys and girls who would send me the largest heads from the most vigorous plants of wheat and oats on their fathers' farms. I had a wonderful response, and I paid that money in prizes with as much enjoyment as any money I ever spent. The letters I got from farmers, and from their boys and girls, were so encouraging that in the following winter I went to Sir William C. Macdonald and said: 'Here is a great chance to do some educational work in progres-

sive agriculture.' . . . I told him I would like to have him give me $10,000 for prizes to set this thing going and to keep it up for three years. He provided the money with all good will, and my little $100 came back a hundred fold. The prizes were offered to boys and girls to encourage selecting the largest heads of the most vigorous plants and growing seed from those heads on a plot by itself. There was a yearly competition for every province; and a main competition extending over three years. Any boy or girl living on a Canadian farm, who was under eighteen years of age, could enter as a competitor. In each province ten prizes were offered for oats and ten for wheat, the prizes in the yearly competition ranging from $25 for the first down to $5 for the tenth. Over fifteen hundred entries were received, of whom eight hundred satisfactorily completed their first year's work, and four hundred and fifty completed the three years' course.

"The competitor was required to pick by hand the largest heads from the most vigorous and productive plants in sufficient quantity to obtain seed with which to sow a quarter of an acre of ground, which became the stock seed grain plot, now called the hand-selected seed plot. Before the crop of this quarter of an acre was harvested, the competitor again selected the largest heads from the most vigorous plants in sufficient quantity to sow the quarter of an acre, which became the hand-selected seed plot for the following year. Out of the heads selected each year the competitor sent to me at Ottawa one hundred of the largest. A careful record was kept of the number of grains per hundred heads, and also of

the weight per hundred. From 1900 to 1903, the average increase in all Canada for spring wheat was 18 per cent in the number of grains per hundred heads, and 28 per cent in the weight. For oats the increase was 19 per cent in the number of grains, and 28 per cent in their weight. . . .

"The main competition was based on the yields from those hand-selected seed plots. The competitors had to select annually out of these, from the most vigorous plants bearing the largest heads, 35 pounds of oat heads or 50 pounds of wheat heads. In this competition we paid 174 prizes, amounting to $5,425; so that altogether we paid $10,842 in prizes. The sum which Sir William C. Macdonald put into the bank, with the interest, brought me out square, plus a great deal of valuable information, plus much happiness in administering the work."—Robertson, J. W.: Education for Rural Life in Canada.

NOTE 5, PAGE 71

In 1908 The Ontario Agricultural and Experimental Union instituted a Schools' Division with the general aim of adapting the work of the Union "to suit the capacities of school children and to organize it in such a way that teachers would be encouraged to direct the children in it and to use the many experiences arising in the practical work as a means of education in the school." This new plan aimed to bring the work *directly to the schools* and make it distinctly for the schools.

The work was divided into The Children's Gardening Section and The Schools' Experiment Section. One sent packets of seed to the children for their

school or home gardens; the other offered seeds free for *four* observation plots in the school garden or in adjoining fields. There was to be a plot showing seven different species of wheat (agriculture); one growing different maples (forestry); one with different kinds of onions (horticulture); and a plot to show different kinds of nasturtiums (floriculture). One hundred and sixteen schools, 150 teachers entered on the work and returns were made by 48 per cent of them

The work has thoroughly recommended itself by its good effect on the school discipline, and in bringing home and school together. Another year seeds will be sold to the children. Tree seeds and a special collection of vines will also be offered, and printed instructions will be given them as well as the teachers. —From advance sheets of Report of Schools' Division of Agricultural and Experimental Union. By courtesy of Prof. S. B. McCready.

NOTE 6, PAGE 73

"At the Macdonald school gardens children are to be taught three important matters in connection with agriculture; namely, the selection of seed, the rotation of crops, and their protection against blight and disease. In six of the gardens the experiment of growing two plots of potatoes side by side, spraying one not at all and the other three to five times in the course of the season, gave in the treated plots a gain in harvest as follows: Knowlton, Que., 111 per cent; Richmond, Ont., 100 per cent; Carp, Ont., 85 per cent; March, Ont., 81 per cent; Guelph, Ont., 43 per cent; Brome, Que., 41 per cent."—Robertson, J. W.: Education for Agriculture, page 5.

NOTE 7, PAGE 107

PLANTS FOR ALL SORTS OF SOIL AND ALL KINDS OF GARDENS

The letters in parenthesis give hints as to duration of each plant as follows: (A) annual herb; (P) perennial herb; (S) shrub; (T) tree; (B) bulb; (V) vine.

Flowers for Drifting Sands

Rose moss . . . . Portulaca grandiflora (A)
Sacaline . . . . . Polygonum Sachalinense (P)
Sunflower . . . . . Helianthus spp. (A and P)
Sand Cherry . . . Prunus pumila (S)
Spurrey . . . . . Spergula arvensis (A)
St. John's-wort Hypericum prolificum (S)
Swallow thorn . Hippophaë rhamnoides (S)

Flowers for Heavy Clay

Forget-me-not . Myosotis palustris (P)
Columbine . . . . Aquilegia spp. (P)
Gas plant . . . . . Dictamnus albus (P)
Sweet pea . . . . . Lathyrus odoratus (A)
Zinnia . . . . . Zinnia elegans (A)
Lilac . . . . . Syringa vulgaris (S)
Rose of Sharon Hibiscus Syriacus (S)
Shrubby cinquefoil . . . . . Potentilla fruticosa (S)

Flowers for the Seashore

Cobœa scandens (A)
Nasturtium . . . Tropæolum spp. (A)
Portulaca . . . . Portulaca grandiflora (A)
Zinnia . . . . . Zinnia elegans (A)
Red bearberry Arctostaphylos uva ursi (S)
Sand Cherry . . Prunus pumila (S)
Swallow thorn Hippophaë rhamnoides (S)
Tamarisk . . . . . Tamarix Chinensis
Poppy-mallow Callirhoë involucrata, var. linearıloba
Sacaline . . . . . Polygonum Sachalinense (P)
Sunflower . . . . Helianthus spp. (P)

Flowers for the Rock Garden

Baby's breath. Gypsophila spp. (A and P)
Blue bells . . . . . Campanula rotundifolia (P)
Carpathian harebell . . . . . Campanula Carpatica (P)
Rock-cress . . . . Aubrietia deltoidea (P)
Moss pink . . . . . Phlox subulata (P)
Daphne . . . . . Daphne Cneorum (S)

Flowers for the Rock Garden (*Continued*)

Saxifrage.....Saxifraga spp. (A and P)
Creeping barberry.....Berberis repens (S)
Crowberry....Empetrum nigrum (S)
Mountain laurel.....Kalmia latifolia (S)

Flowers for Ponds and Water Gardens

Arrowhead....Sagittaria spp. (P)
Floating heart.Limnanthemum lacunosum (P)
American lotus Nelumbo lutea (P)
Cape pondweed.....Aponogeton distachyum (P)
Water-lily.....Nymphæa spp. (P)
Pickerel-weed .Pontederia spp. (P)

Flowers for the Bog Garden

Cardinal flower Lobelia cardinalis (P)
Sundew.....Drosera filiformis (P)
Spice bush....Benzoin odoriferum (S)
Virginian willow.....Itea Virginica (S)
Iris.....Iris lævigata (P)
Crowfoot.....Ranunculus spp. (P)
Joe-Pye-weed .Eupatorium purpureum (P)
Pitcher plant..Sarracenia purpurea (P)
California pitcher plant...Darlingtonia Californica (P)
White alder ...Clethra alnifolia (S)

Flowers for Cold Climates

(The perennials are hardy at Ottawa)

Golden tuft ...Alyssum saxatile (P)
Iceland poppy.Papaver nudicaule (P)
Marigold.....Tagetes spp. (A)
Pansy.....Viola tricolor (A)
Sweet pea.....Lathyrus odoratus (A)
English daisy..Bellis perennis(P)
Sheepberry....Viburnum Lentago (S)
Saxifrage.....Saxifraga spp. (P)
Buttonbush ...Cephalanthus occidentalis (S)
Daphne.....Mezereum (S)
St. John's-wort Hypericum Kalmianum (S)

Flowers for Hot Climates

(e. g., Tampa, Florida)

Coneflower....Rudbeckia hirta (P)
Gunnera manicata (P)
Funkia spp. (P)
Iris Japonica (P)
Weigelia.....Diervilla spp. (S)

Flowers for Hot Climates (*Continued*)

Carolina all-spice.....Calycanthus floridus (S)
Rose moss.....Portulaca grandiflora (A)
Morning-glory Ipomœa purpurea (A)
American camellia.....Stuartia pentagyna (A)
Amaranth.....Amarantus spp. (A)
Nasturtium ...Tropæolum spp. (A)

Flowers that Blossom before Trees are Leafy

Daphne.....Mezereum
Golden bell....Forsythia suspensa (S)
Shadbush .....Amelanchier Canadensis (T)
Glory-of-the-snow.....Chionodoxa Luciliae (B)
Japanese quince.....Cydonia Japonica (S)
Judas tree.....Cercis Canadensis (T)
Snowdrop.....Galanthus nivalis (B)
Blue bells.....Mertensia pulmonarioides (P)
Hyacinth.....Hyacinthus orientalis (B)
Crocus.....Crocus spp. (B)
Anemone blanda (P)
Magnolia Yulan (T)
Red Maple ....Acer rubrum (T)
Candytuft.....Iberis sempervirens (P)
English daisy..Bellis perennis (P)

Flowers that will Blossom after Frost in the Autumn

Gaillardia aristata (P)
Goldenrod.....Solidago spp. (P)
Iceland poppy.Papaver nudicaule (P)
Goldentuft ....Alyssum saxatile (P)
Ten-weeks stocks.....Matthiola incana, var. annua (A)
Sweet alyssum.Alyssum maritimum (A)
Candytuft.....Iberis spp. (A)
Phlox Drummondii (A)
Clarkia elegans (A)
Chrysanthemum.....spp. (P)

Plants for Window-Boxes, Vases, Hanging-Baskets, etc.

Artillery plant.Pilea serpyllifolia
Alyssum .....spp. (A)
Little pickles..Othonna Capensis (P)
Dwarf nasturtium.....Tropæolum spp. (A)
Periwinkle.... Vinca major (P)
German ivy ...Senecio mikanioides
Wandering Jew.....Zebrina pendula (P)
Lobelia Erinus (A)
Centaurea cineraria (A)
Coleus.....spp. (A)
Geranium.....Pelargonium spp. (A)
Helichrysum petiolatum (P)

Flowers for the Wild Garden

(A) Choice wild flowers which should not be taken from the woods even for garden purposes and which, if ordered from dealers, should be nursery-grown, not collected:

Native orchids, especially lady's slippers
Mountain laurel.....Kalmia latifolia
Trailing arbutus.....Epigæa repens(P)
Fringed gentian.....Gentiana crinita (P)
Giant laurel ..Rhododendron maximum (S)

(B) Common wild flowers that improve greatly in cultivation and are easy to grow. These are in no danger of extermination:

Yarrow.....Achillea Millefolium
Joe-Pye-weed .Eupatorium purpureum (P)
Bugbane.. ...Cimicifuga racemosa (P)
Oswego tea....Monarda didyma (P)
Asters and goldenrods
Button snakeroot.....Eupatorium ageratoides (P)

Flowers for the Desert Garden

The following have withstood twenty degrees below zero, F Good drainage in winter is essential.

Yucca filamentosa
Yucca glauca (angustifolia)
Mammillaria Missouriensis
Mammillaria vivipara
Echinocereus viridiflorus
Echinocactus Simpsoni
Echinocactus Simpsoni, var. minor
Opuntia arenaria
Opuntia arborescens
Opuntia Camanchica
Opuntia Camanchica, var. gigantea
Opuntia fragilis
Opuntia mesacantha, vars. Greenii cymochila, macrorhiza
Opuntia phæacantha, var. major
Opuntia polyantha, vars. albispina and Watsoni

Vines for City Walls and Porches

Boston ivy....Ampelopsis tricuspidata
English ivy....Hedera Helix
Virginia creeper.....Ampelopsis quinquefolia
Dutchman's pipe.....Aristolochia macrophylla
Ampelopsis Veitchii
Trumpet creeper.....Tecoma radicans
Clematis spp.
Actinidia arguta
Akebia quinata
Wistaria Chinensis
Lonicera Japonica

Flowering Shrubs for Hedges

Tartarian honeysuckle.....Lonicera Tartarica
*Japanese quince.....Cydonia Japonica
Cockspur thorn.....Crataegus Crus-galli
Thunberg's barberry....Berberis Thunbergii
Spiræa prunifolia
*California Privet.....Ligustrum ovalifolium
Deutzia gracilis
*Common barberry.....Berberis vulgaris (Purple-leaved barberry)
*Rose of Sharon or Althæa...Hibiscus Syriacus.
Viburnum spp.
Japan evergreen honeysuckle.....Lonicera Japonica

Trailers and Ground Covers

Creeping Charlie.....Lysimachia nummularia
Japanese honeysuckle....Lonicera Japonica
English ivy....Hedera Helix
Bitter-sweet...Celastrus scandens
Perennial pea .Lathyrus latifolius
Virgin's bower.Clematis Virginiana
Rosa rugosa
Periwinkle....Vinca minor
Mitchella repens

Vines Requiring Support

Wistaria Chinensis
Dutchman's pipe.....Aristolochia macrophylla
Morning-glory Ipomœa purpurea
Scarlet runner bean.....Phaseolus multiflorus
Japanese hop..Humulus Japonicus, var. variegatus
Clematis spp.
Ampelopsis Veitchii
Balloon vine ..Cardiospermum Halimac-cacabum
Boston ivy....Ampelopsis tricuspidata
English ivy....Hedera Helix
Trumpet creeper.....Tecoma radicans
Bitter-sweet...Celastrus scandens
Honeysuckles (climbing species).....Akebia quinata

Flowers for "Garden Effects"

Fox-glove	Digitalis purpurea (P)	Gladiolus	Gladiolus spp. (B)
Sweet-william	Dianthus barbatus (P)	Spiræa	spring-blooming species (S)
Goldenrod	Solidago spp. (P)	Geranium	Pelargonium spp. (A)
China aster	Callistephus hortensis (A)	Alyssum	spp. (A) (P)
Japanese quince	Cydonia Japonica (S)	Deutzia	spp. (S)
Japanese Iris	Iris lævigata (P)	Dutch hyacinth	Hyacinthus orientalis (B)
Tulip	Tulipa spp. (B)		

The above list, except for three additions, is as it appeared in "Country Life," March, 1904, and is repeated here by express permission of Doubleday, Page and Company, New York.

NOTE 8, PAGE 134

Vegetable Seeds

1 peck improved variety of potatoes; 1 lb. beans, 2 varieties; 1 lb. sugar corn, 2 varieties; ¼ lb. beets, 2 varieties; 1 oz. carrots, 2 varieties; ½ oz. seed onion, 2 varieties; 2 oz. radish, 2 varieties; 1 oz. lettuce, 2 varieties; 1 oz. parsnip; 1 oz. turnip; 1 pkt. cucumber; 1 pkt. cress; 1 pkt. kale; 1 pkt. kohl rabi; 1 pkt. summer savory; 1 pkt. sage.

The following to be started in a hot bed or window box; 1 pkt. cauliflower; 1 pkt. Brussels sprouts; 1 pkt. celery; 3 pkts. cabbage, 3 varieties; 3 pkts. tomato, 3 varieties. Estimated cost, $2.

Flowering Annuals

To be started indoors or in hot bed: 3 pkts. aster, mixed or 3 named varieties; 2 pkts. balsams, mixed; 2 pkts. dianthus (pinks); 1 pkt. pansy; 1 pkt. petunia; 1 pkt. portulaca; 2 pkts. phlox Drummondi grandiflora; 1 pkt. Ricinus (Castor bean); 1 pkt. scarlet sage; 1 pkt. salpiglossis; 1 pkt. sweet scabious; 1 pkt. ten-weeks stocks; 1 pkt. verbena.

For open planting: ½ oz. sweet alyssum: ½ oz. candytuft; ½ oz. mignonette; 2 pkts. dwarf nasturtium; 2 pkts. Eschscholtzia (California poppy); 2 pkts. Shirley poppy; 1 pkt. double mixed poppy; 1 pkt. tall nasturtium; 1 pkt. mixed sweet peas; 1 pkt. double hollyhock (biennial); 1 pkt. Russian sunflower. Estimated cost $2. . .

From Circular No. 13, July, 1909, Elementary Agriculture and Horticulture and School Gardens. Toronto, 1909.

NOTE 9, PAGE 152
EXPERIMENTAL PLOTS IN PHILADELPHIA GARDENS

Crops Grown for Subterranean Parts

Root Crop		*Tuber Crop*	*Bulb Crop*
Beet	Radish	Potato	Onion
Carrot	Salsify	Sweet potato	
Parsnip	Turnip		

Crops Grown for Foliage Parts

Cole Crops		*Salad Crops*
Kale	Brussel Sprouts	Lettuce
Cabbage	Kohl Rabi	Endive

Crops Grown for Fruit or Seed Parts

Pulse Crop	*Solanaceous Crop*	*Cucurbitaceous or Vine Crop*	
Bean	Tomato	Cucumber	Pumpkin
Pea	Egg plant	Melon	Squash
	Pepper		

NOTE 10, PAGE 162*

PLANTING SCHEME FOR SCHOOL GARDEN

COURTESY OF E. K. THOMAS, PROVIDENCE, R. I.

Ft.	Crop	Depth to Plant	Average time of Growth	Distance Apart in row
1	Corn, Squantum 1¼ ft.	2″ to 2½″	13 weeks	Plant 4″ apart, thin to 8″
2	Lettuce 1¼ ft.	½″	6–8 weeks	Hills 6″ apart
3	Corn, Early Cory 1¼ ft.	2″ to 2½″	11 weeks	Same as above
4	Lettuce 1¼ ft.	½″	6–8 weeks	Same as above
5	Tomatoes 1¼ ft.	Plants	16 weeks	Plants 18″ apart
6	Turnip, Early 1¼ ft.	¾″ to 1″	9 weeks	In drills
7	Tomatoes 1¼ ft.	Plants	16 weeks	
8	Peas 1¼ ft.	2″		2″ to 3″ apart
9	Cabbage 1¼ ft.	Plants	18 weeks	Plants 2 ft. apart
10	Peas 1¼ ft.	2″	9 weeks	
11	Potatoes 1 ft.	3″	15 weeks	Sets 6″
12	Radish 1 ft.	2″ to 2½″		
13	Beans 1½ ft.		9 weeks	6″ to 8″ apart
14	Beans 1½ ft.			6″ to 8″ apart
15	Carrots ¾ ft.	½″ to 1″	16–20 weeks	In drills
16	Radish 1 ft.			
17	Beets	1 in.	9 weeks	In drills
18				
19				
20				

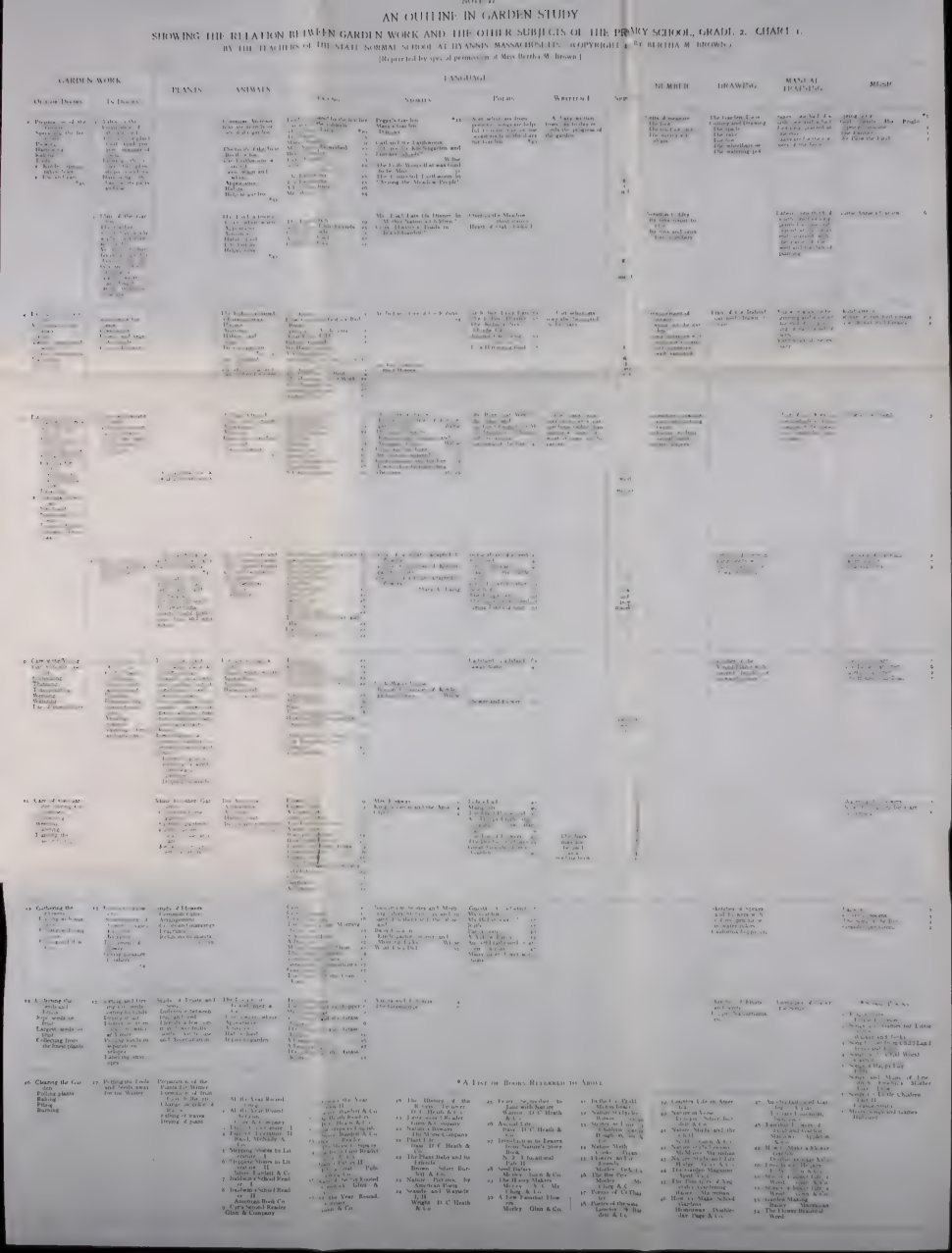
*See also Note 17a and 17b

AN OUTLINE IN GARDEN STUDY

SHOWING THE RELATION BETWEEN GARDEN WORK AND THE OTHER SUBJECTS OF THE PRIMARY SCHOOL, GRADE 2. CHART 1.

BY THE TEACHERS OF THE STATE NORMAL SCHOOL AT HYANNIS, MASSACHUSETTS. (COPYRIGHT) BY BERTHA M. BROWN.

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*A List of Books Referred to Above

NOTE 12, PAGE 191

- CHECK LIST AND TABLE OF THIRTY-FOUR COMMON BUTTERFLIES
  - SWALLOWTAILS
    - Tiger
    - Black
  - PIERIDS
    - WHITES
      - Cabbage
    - YELLOWS
      - Roadside
  - NYMPHS
    - FRITILLARIES
      - Great Spangled
      - Silver Spot
      - Meadow
      - Silver Bordered
    - CRESENT SPOTS
      - Pearl
      - Silver
      - The Baltimore
    - ANGLE WINGS
      - THISTLE BUTTERFLIES
        - Red Admiral
        - Painted Beauty
        - Cosmopolite
      - Mourning Cloak
      - American Tortoise Shell
      - Compton Tortoise
      - POLYGONS
        - Violet Tip
        - Hop Merchant
        - Gray Comma
        - Green Comma
    - SOVEREIGNS
      - Banded Purple
      - Red Spotted Purple
      - Hybrid Purple
      - Viceroy
  - MEADOW BROWNS
    - Blue-eyed Grayling
    - Dull-eyed Grayling
    - The Eyed Brown
  - THE MILKWEED
    - The Monarch
  - THE GOSSAMER WINGS
    - HAIR STREAKS
      - Gray Hair Streak
      - Banded Hair Streak
    - COPPERS
      - The Wanderer
      - American Copper
    - BLUES
      - Spring Azure

By permission. From Cornell Home Nature Study Course, New Series Vol. III, No. 4, p. 16.

NOTE 13, PAGE 192

PLANTING, PRICKING OUT, TRANSPLANTING AND POTTING

Planting Seeds in Flats.—At the florists, earthen seed-pans can be bought or wooden boxes called flats. The first are expensive; the second can be easily made by teacher, by pupils in manual training class or by almost any child, from the pine boxes so largely used for packing canned goods, soaps, etc. These can be bought for five or ten cents apiece, and are sometimes given away. These boxes are usually 9 or 10 inches deep and can be cut in 3 inch sections with a rip saw. The top and bottom make two flats. The middle sections of two or three boxes put together will make another flat. Bore a number of 1 inch auger holes in the bottom of each flat for drainage.

Soil: The flat may be filled with earth in the presence of the children so that they may see how thoroughly the soil should be prepared. From two boxes or piles, one of rich soil, the other of sand, take three parts sand and one part soil, and with the hands or a scoop (better hands) thoroughly mix them. Then, using an ordinary flour sieve, sift the mixture through it. First put into the flat a layer of broken flower pots, cinders or small stones, explaining that this is done so as to give good drainage and to prevent the water from settling into little pools and causing the seeds to rot or the soil to mould or become sour. Over the layer of broken stuff, spread the coarse screenings from the earth just mixed until the flat is about half full. Then add the finely sifted soil. See to it that the soil is pushed well into the corners

and up to the edges so as to avoid the danger of the washing out of seeds. This may be done with a flat piece of wood or brick or "float." The florist's float, with which he compacts the soil in his hot bed, greenhouse or cold frame, is a piece of board 6 inches wide by 9 or 10 long with a handle attached. Another reason for compacting the soil about seeds or roots is to bring close to them the fine particles of food in the soil and the invisible little films of moisture that must cover the food grains and dissolve them before the plant can feed upon them. Consequently, while the soil in the box must be fine and soft for the little plants, it must lie more closely together than if just thrown into the box, and so it must be "firmed" or pressed close to the edges and into corners, and the box filled as full as it will hold. If then the whole surface is gently pressed, there will still be room for the planting of all seed. Tiny seeds must be sown broadcast. Small seeds are better in rows where any irregularity in their coming up will show the relative value or quality of the seed. With a pointed stick scratch the lines for the seed rows or make a furrow say from 1 inch deep for seeds the size of a grain of wheat to two inches for those as large as the bean. While individual characteristics of seeds modify the depth to plant, there is a general rule that seeds under artificial conditions of planting should be put in the ground to a depth equal to their greatest diameter, and that, when planted in the open, the depth should be four times their diameter. Moderate size seeds should lie one-half inch apart. In all cases after sowing, the seeds should be covered with a layer of fine soil, and firmed. Those in flats should then be

watered very carefully so as not to dislodge them. One may sink the flat in water and leave it until moisture appears upon the surface of the soil. One may water with a fine spray directly, or upon a layer of thin porous paper, like tissue or newspaper. With a greenhouse, the flats may be placed under the benches, for the desirable thing is darkness, moderate warmth and moisture until the little heads break through the earth. Avoid too much wetness and gradually accustom the baby plants to the strong sunshine or they will damp off, rot at the surface of the soil and wither even more quickly than if allowed to perish for want of water. Greenhouse warmth is desirable because bottom heat draws moisture down to the forming roots while top heat tends to rapid evaporation and consequent drying out. *Label and Date.* It is better to have a uniform place for placing the label and to put on it date of planting, name of plant and the children's initials when they do the work themselves.

Pricking out Seedlings.—When the little plants have put forth their first or second leaves and perhaps have become too crowded, or when they have grown larger and it is still too cold to plant them out of doors, or when there are not a sufficient number of small flower pots for transplanting them, it will be necessary to "prick out the seedlings."

Soil: The same as for seedlings and the flats filled in like manner. When moving the plants do not attempt to take them out one by one, but first wet the soil, then very carefully run the point of a trowel or a flat pointed stick down the side of the flat until it is below the roots. Take up an inch or two of earth

(if the seedlings be from seed sown broadcast) or a larger portion if they are in rows. Lay these on a board in a shaded place; carefully separate each plant and gently shake the earth from each before replanting it.

Resetting: Begin at the left-hand corner of the freshly filled flat, the corner farthest from you, and with your finger or a dibble make a hole deep enough to drop in the full length of the roots of the seedling so as to have it stand upright when transplanted and at a little lower depth in the earth than in its previous home. Firm the soil around the roots and stem. Set the plants about two inches apart, keeping the rows straight. *Label.* Sprinkle well and set away out of the sun until the plant has had time to establish itself; most plants will do this in twenty-four hours or a little longer. A small dibble can easily be shaped from a clothespin; one of larger size for outdoor planting from the end of a broom handle or the handle of a broken garden tool; if such tool has a handle, as an old spade, leave on for greater comfort in using.

Potting Seedlings.—Soil: When the time comes for potting, the plant has become strong enough to require more food and to risk some dangers. As a seedling we treated it like a baby. We had to give it food, but we tried to do it so that if there was anything in the food that might disagree with it, any germs of the diseases that attack plants, or any insects, we should have as few as possible. We carefully sifted the soil that there should be no cut worms or other evil things that we could see to get rid of. We gave the little seed for its first food that which was well

fitted for it, and only enough, supplying it with clean sand that helped to hold the warmth for the seedling and also to shed excess of water. Now the little plant is ready to make some resistance to disease and must have a larger pasturage for its roaming roots. So we will use one part sand instead of three as before, add one part of soil, and make up our whole by adding a third part of well rotted manure. If absolutely necessary, or for convenience in handling, its equivalent in commercial fertilizer may be used, and all be sifted together.

For Pots: Use the one and a half inch or two inch pots. As they are very porous and would rob the plants of all the water with which they are wet the first time, the pots must be thoroughly soaked; they must also be thoroughly clean before using.* First, wash them lest they have any dirt or mould to harm their new tenants. Then in the bottom of each pot place bits of stone for drainage. Fill the pot about a third full of the prepared soil, using only the finer siftings. Lift the plant or plants carefully, taking one at a time, hold it with the left hand in the center of the pot, and fill in the soil evenly on all sides, pressing it firmly until it comes to within about one fourth or one half inch of the top of the pot. *Label.*

Water: It is better to do this by placing the pots in water and allowing the moisture to soak up through the pots. Set away in the shade or cover with a paper until the plants have established themselves.

Shifting or Repotting.—Soil: Here again the soil

* Many times the cheaper paper pots at small cost per hundred may be used. These may be later buried in the ground and allowed to decompose.

changes to two quarts sand, four quarts soil, four quarts well-rotted manure well sifted and having added to it one half pint fine ground bone. This, thoroughly mixed, makes a good food supply for larger plants. In any of these soil compositions, cow manure, a "cold" manure, can be advantageously substituted for well-rotted horse manure. The pots should change according to development of plant to sizes one half inch or inch larger, at each resetting.

Method of Shifting: Have the earth in the pot from which the plant is to be removed slightly damp. It will come out easier, the soil will adhere together instead of crumbling, and the roots of the plant will be less disturbed. Remove the plant by inverting its pot and rapping it slightly on the edge of a bench or table. Meanwhile hold the plant so that its ball of earth will fall lightly into the left hand; crumble a little earth from the upper and lower edges of the ball so as to expose a fresh, clean surface. Remove any adhering drainage and reset in a pot one third filled with earth. Firm the soil well about the plant, keeping it erect and well centered. *Label.* Water and set away in shade for twenty-four hours.

Transplanting.—An easy method of transplanting is to take any ordinary board 1 foot wide and as long as the bed is wide. Space it off into squares 2 x 2 inches or 2 x 3 inches according to the distance apart the plants are to be set and bore a $\frac{3}{4}$ inch hole at each cross and drive into this a pin that has been sharpened rather bluntly, that will project about $3\frac{1}{2}$ inches. Lay the board on the bed pegs down and step on it. This will drive the pins into the earth making places for the plants. Then lift the board and move it back

its own width and stand on it and set the plants in the holes just made. Move the board as before and set plants and proceed in this manner till the bed is finished. By this method the earth in the bed is evenly firmed and the plants are put in perfect regularity. (Suggested by R. F. Powell.)

NOTE 14, PAGE 98

TYPES OF RECORDS

From School Gardening for California Schools, by B. M. Davis

Teacher's Record

Lessons	Practical Work	Observations
Instruction and demonstration of garden preparation.	Garden preparation.	Look for earthworms.
Instruction and demonstration of seed planting.	Plant radishes.	Look for earthworms.
Instruction in making plant records.	Plant carrots, beets.	.....

Child's Record

Date	Work	Observations
Nov. 10	Finished garden by breaking clods and raking.	Found some earthworms
Nov. 11	Planted radishes and lettuce.	Looked for earthworms, but found none.
Nov. 12	Planted onion sets.	.....
Nov. 13	Planted carrots and beets.	.....
Nov. 14	.....	Radishes coming up.
Nov. 15	.....	Rain.

A Plant Record

Name of Plant	Variety	Time of Planting	No. of Rows	No. of Plants or Seeds	Harvest Time	Harvest No.	Harvest Weight	Enemies		Remarks
								Animals	Fungi	
Radish	French Breakfast	Nov. 10	½	40	Dec. 20	10	..	None	None	Thinned out 10 plants
Radish	Scarlet Turnip	Nov. 10	½	40	Dec. 18	18	..	None	None	Thinned out 8 plants

NOTE 15, PAGE 199

COOKING NOTES

Such brief recipes as the following may be given children, especially those of foreign born parentage. (Do not forget the limitations of your pupils' homes. Give the simplest directions.)

The One Constant Rule For Cooking Vegetables: All fresh vegetables should be plunged in boiling water. All dried vegetables should be placed in cold water and brought to a boil.

(1) Spinach: Wash leaves thoroughly. Boil water, add salt, put in leaves; when tender, strain, eat with vinegar; or chop the leaves fine and add sauce, heating the spinach in it. When ready, serve with slices of hard boiled egg as a garnish.

(2) Swiss chard: Boil leaves until tender and eat with vinegar or add a sauce as for lettuce.

(3) Beets: Boil the leaves when young and eat with vinegar or sauce, or boil the root, skin, slice and add vinegar.

(4) Turnip: Wash the root thoroughly; cook in

salted boiling water, mash, season with butter, pepper and salt, or cut in slices and add sauce.

(5) Lettuce: May be eaten with sugar and vinegar, with oil or with mayonnaise dressing made thus: Yolk of one egg beaten and add to it 1 teaspoonful of made mustard; pour in olive oil, beating until quite thick; season with $\frac{1}{4}$ teaspoonful of salt and pepper and 3 tablespoonfuls of vinegar. This will be enough for two salads and will keep.

Older lettuce: Take the best inner leaves, wash, put in boiling water; add a little salt; cook until tender, strain, cover with sauce made of melted butter and a little flour and salt.

(6) Radish: Eat the root with salt; also with vinegar.

Teach the use of as many *new* greens for cooking as possible. Foreign children may be able to teach the teacher. New Englanders sometimes use the tender shoots of milkweed as a salad or salt them down so as to have greens in winter time. Purslane, dandelion, etc., are used.

NOTE 16, PAGE 222

INSECTICIDES

Injurious insects are divided into two great classes, the biting, gnawing, or chewing insects which actually eat some part of the plant they attack, and the sucking insects which slowly draw the juices from the plants. Common types of the first are beetles and grass hoppers; of the second, aphids, plant bugs and scale insects. Dose the first with something that will poison their food, generally some form of arsenical

poison, as Paris green. Give the second something that they will inhale and that will stop their breathing, like hellebore, pyrethrum, or something that will smother them, like emulsions of kerosene oil, whale oil soap, etc. Bordeaux mixture is good for blight.

NOTE 17, PAGE 225

SCHOOL OF HORTICULTURE, HARTFORD, CONN.

Plan of 20-foot Garden. (*1st year*)

North

20 Corn
19
18 Beans (18½)
17
16
15 Beans (15½)
14 Tomatoes
13 Lettuce
12 Peas
11
10 Peas
9
8 Parsnip
7
6 Carrots
5
4 Swiss Chard
3
2 Beets and Cabbage
1

Line Flowers

South

Plan of 50-foot Garden, 1900. (*4th year*)

50 Corn (Hills 12 in. apart)
49
48½ Beans
47 Corn and Squash (summer)
46
45½ Beans
44 Corn and Turnips (Thin turnips well)
43 Spinach
42
41 Tomatoes
40 Turnips
39
38 Tomatoes (3 hills)
38 Cucumbers (4 hills)
37
36
35 Tomatoes (3 hills)
34
33
32 Potatoes
31
30
29 Potatoes
28
27 Turnips (July 15)
26 Celery
25 Turnips (July 15)
24 Celery
23
22 Lima Beans
21
20 Peppers (5 hills)
19
18 Peas
18 (later, transplanted cabbage)
17
16 Peas
16 (later, transplanted cabbage)
15
14 Egg-plant (5 hills)
13

SCHOOL OF HORTICULTURE, HARTFORD, CONN.—(*Continued*)

12	Peppers (5 hills)
11	
10	Cabbage and Beets (Cabbage seed 12 in. apart among the beets)
9	
8	Swiss Chard
7	
6	Parsnips and Radish (planted together)
5	Beets and Onion Sets (Sets 6″ apart)
4	Carrots and Parsley (every 12 in.)
3	Beets
2	Onion Sets
1	Choice of Flowers or Vegetables
Line	Flowers

May 15, lettuce, radish and turnip planted. May 22, peas, beets and Swiss Chard. June 5, Corn. Other planting up to July 1st

Lettuce planted and transplanted wherever convenient

NOTE 17 *a*

PLANTING TABLE FOR FLOWERS

(Reprinted by special permission from Suburban Life, March, 1906)

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This table holds good for outdoor planting in Massachusetts, Rhode Island and the southern part of New Hampshire. For the northern part of New Hampshire Vermont and Maine it should be figured three weeks later. For Connecticut, New York, New Jersey and Pennsylvania it should be figured three weeks ahead of the time given here. All of the middle western states can be figured the same as New York, but all states south of Pennsylvania should be figured twelve days in advance for every one hundred miles southward. The depth to plant is not given, as such directions are often misleading. Small seeds should not be covered at all. The rule for the larger seeds is to bury them to a depth of four times their size.

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Variety	When to Sow Seed			When to Set Out Plants	Distance to Transplant	Height of Plants	Season of Bloom	Color of Bloom
	Indoors	Frames	Outdoors					
Achillea (Sneezewort)	....	....	June to October	May to June	12 inches	2½ feet	July to October	White
Ageratum	March	April	May	May 15 to June 15	6 inches	4 to 8 inches	June to October	Blue, white
Alyssum (Annual)	....	April	May 1 to June 15	May 15 to June 15	4 inches	3 to 6 inches	June to October	White
Alyssum (Perennial)	....	....	June 1 to Sept. 15	May 1 to June 15	6 inches	6 inches	July to October	Yellow
Aquilegia (Columbine)	....	....	June 15 to Sept. 15	May to Sept.	8 inches	2½ feet	June to September	White, yellow, blue pink, variegated
Asters (China)	March to April	March to May	May 10 to June 15	May 15 to June 15	9 inches	1 to 3 feet	July to October	White, pink, red, lavender, purple, yellow
Asters (Perennial)	....	....	June 15 to Sept. 15	May 1 to June 15	12 inches	1 to 3 feet	October	White, pink, blue
Balsam	....	April to May	May 10 to June 1	May 15 to June 15	9 inches	1½ feet	July to September	White, pink, yellow, red
Calendula (Pot Marigold)	....	April to May	May 1 to June 15	May 15 to June 15	6 inches	9 inches	June to October	Yellow, orange
Calliopsis	....	April to May	May 1 to June 1	May 15 to June 15	6 inches	1½ feet	July to October	Yellow, brown

Planting Table for Flowers—(*Continued*)

Variety	When to Sow Seed			When to Set Out Plants	Distance to Transplant	Height of Plants	Season of Bloom	Color of Bloom
	Indoors	Frames	Outdoors					
Campanula (Canterbury Bells)	....	June 15 to Sept. 15	June 15 to Sept. 15	May 15 to June 10	12 inches	2 to 2½ ft.	June to August	Blue, white, pink
Celosia (Cockscomb)	March to May	April to May	May 15 to June 1	May 15 to June 15	6 inches	6 inches to 1 foot	June to October	Red, white, yellow pink, purple
Candytuft	....	April to May	May 15 to June 15	May 15 to June 15	4 inches	1 foot	June to October	White, pink, red, purple
Carnation (Marguerite)	March to May	April to May	....	May 20 to June 15	6 inches	1½ feet	August to October	White, pink, red yellow
Centaurea (Cornflower)	....	....	April 15 to June 15 also Aug. 30 to Oct. 30	....	Thin out	2 feet	June to October	Blue, white, pink
Chrysanthemum (Annual)	April to May	April to May	May 1 to June 1	May 15 to June 15	6 inches	1½ feet	July to October	White, yellow, deep red
Cosmos (Early)	April to May	April to May	May 15 to June 1	May 15 to June 15	12 inches	2½ feet	July to September	White, pink, red
Cosmos (Late)	March to May	March to May	May 1 to June 1	May 15 to June 15	12 inches	6 feet	September to October	White, pink, red, orange
Dahlia	March to May	March to May	....	May 15 to June 15	3 feet	4 feet	August to October	White, yellow, pink, red
Delphinium (Hardy Larkspur)	....	June to August	June 15 to Sept. 15	May to June	12 inches	2 to 5 feet	July to October	Blue, white, yellow
Dianthus (China Pinks)	March to May	April to May	May 10 to June 1	May 15 to June 15	6 inches	1 foot	July to October	White, red, pink striped
Digitalis (Foxglove)	....	June to August	June to Sept.	May 1 to June 1	9 inches	3 to 4 feet	July to August	Pink, white, blue

Planting Table for Flowers—(*Continued*)

Variety	When to Sow Seed			When to Set Out Plants	Distance to Transplant	Height of Plants	Season of Bloom	Color of Bloom
	Indoors	Frames	Outdoors					
Eschscholtzia (California Poppy)	....	....	May 1 to June 1	....	Thin out	9 inches	July to September	Yellow white, orange
Gaillardia	....	April to May	May 10 to June 1	May 15 to June 15	6 inches	1½ feet	July to September	Yellow, red
Gourds	March to May	April to May	May 10 to June 1	May 15 to June 15	4 inches	15 feet	September to October	Fruit-bearing
Helianthus (Sunflower)	April to May	April to May	May 15 to June 15	May 15 to June 15	9 to 18 inches	3 to 6 feet	July to October	Yellow, white
Hollyhock	March to April	April to May	June 15 to Aug. 15	May 1 to June 15	15 inches	5 to 7 feet	August	Red, white, yellow pink, maroon
Ipomœa (Morning-glory)	....	....	April 15 to June 1	....	Thin out	15 to 20 feet	July to September	Red, white, blue
Larkspur (Annual)	March to April	April to May	May 10 to June 15	May 15 to June 15	6 inches	15 inches	June to September	Red, white, pink, blue
Lobelia	Feb to April	March to April	May	May 15 to June 15	4 inches	5 inches	June to September	Blue, white
Lupinus	April to May	April to May	May to June	May 15 to June 15	6 inches	2 feet	July to August	Pink, blue, yellow
Marigold	April to May	April to May	May to June	May 15 to June 15	6 inches	8 inches to 3 feet	July to October	Yellow, red, brown
Mignonette	March to May	April to May	May to June	May 15 to June 15	6 inches	1 foot	July to October	Green with white and red flowers
Myosotis (Forget-me-not)	March to May	April to May	June to July	April 15 to May 15	6 inches	6 inches	June to August	Blue, white, pink
Nicotiana (Tobacco plant)	March to May	April to May	May 15 to June 15	May 15 to June 15	9 inches	3 feet	July to October	White, pink, red, yellow

Planting Table for Flowers—(*Continued*)

Variety	When to Sow Seed			When to Set Out Plants	Distance to Transplant	Height of Plants	Season of Bloom	Color of Bloom
	Indoors	Frames	Outdoors					
Nasturtiums	March to April	March to May	May 1 to June 15	May 15 to June 15	6 inches	1 and 10 feet	June to October	Yellow, red, orange pink, crimson
Pansy	March to May	April to May July to Oct.	July to October	April and Sept.	6 inches	6 inches	April to October	All colors
Petunia	Feb. to April	March to May	May to June	May 15 to June 15	6 inches	1 foot	June to November	Red, white, pink
Phlox	March to May	March to May	May to June	May 15 to June 15	6 inches	1½ feet	July to October	Red, white, pink, yellow
Poppy (Annual)	....	....	April to June Sept. to Oct.	....	Thin out	1 to 2 feet	June to August	Pink, red, white yellow
Poppy (Perennial)	....	June to Sept.	June to Sept.	August	9 inches	1 to 2 feet	June to August	Red, pink, white, yellow
Portulaca	....	....	April to June	....	Thin out	4 inches	July to October	Pink, red, white, yellow
Pyrethrum (Perennial)	....	June to Sept.	June to Sept.	May	12 inches	2 feet	July to August	Pink, red, white
Ricinus (Castor-oil Plant)	April	....	May	May to June	3 feet	4 to 7 feet	....	Ornamental foliage
Salpiglossis	April to May	April to May	May	May to June	6 inches	2 feet	July to October	White, yellow, brown, red
Salvia	Feb. to May	March to May	May	May to June	18 inches	2½ feet	August to September	Scarlet
Scabiosa (Mourning Bride)	April to May	April to May	May	May to June	9 inches	2 feet	July to September	White, pink, yellow, purple
Stock	Feb. to May	March to May	May	May to June	12 inches	1½ feet	August to September	Pink, white, scarlet, yellow
Sweet Pea	....	....	March to April	....	Thin out	6 feet	July to September	All colors

Planting Table for Flowers—(*Continued*)

Variety	When to Sow Seed			When to Set Out Plants	Distance to Transplant	Height of Plants	Season of Bloom	Color of Bloom
	Indoors	Frames	Outdoors					
Sweet William	....	June to Sept.	June to Sept.	April to May	6 inches	2 feet	June to July	Pink, white, red
Verbena	Feb. to May	March to May	May	May to June	6 inches	6 inches	June to October	Red, white, pink, blue
Zinnia	March to May	March to May	May	May to June	6 inches	1 to 3 feet	June to October	Red, white, pink, yellow

NOTE 17 *b*

PLANTING TABLE FOR VEGETABLES

(Reprinted by special permission from Suburban Life, March, 1906)

The dates given in the table below apply to the vicinity of Boston and all the southern part of New England. In northern New England, planting should be done three weeks later. This holds good for sowing out of doors or transplanting out of doors. For starting seeds in the house, this table holds good for the entire eastern states. For Connecticut, New York, New Jersey and Pennsylvania it should be figured three weeks ahead of Boston time. All of the middle western states can be figured the same as New York, but all states south of Pennsylvania should be figured twelve days in advance for every hundred miles southward.

Variety	When to Sow the Seed			When to Set Out Started Plants	Depth Seeds Should be Sown	Distance Apart in the Row	Distance Between the Rows	Distances when Planted in Hills or Drills		Amount of Seed Required	Season of Crop
	Indoors	Hotbed	Outdoors					Between Drills	Between Hills		
Artichoke, Globe	March to April	April	June	June	½ inch	1½ feet	3 feet	....	3 feet	....	September
Artichoke, Jerusalem (Tubers)	....	....	....	May	6 inches	....	....	....	3 feet	3 tubers in hill	September
Asparagus, Seed	....	....	May	....	½ inch	....	....	12 inches	....	1 ounce for 50 feet	May to June
Asparagus, Roots	....	....	....	April to May	8 inches	12 inches	3 feet	....	18 inches	....	May to June
Beans, String or Wax	....	....	May to August	....	2 inches	....	....	2 feet	....	1 quart for 100 feet	July to Sept.
Beans, Lima Bush	April on sod	April on sod	June	End of May	2 inches	....	....	2 feet	....	1 quart for 100 feet	Aug. to Sept.
Beans, Pole	....	....	May to June	....	2 inches	....	....	....	2½ feet	1 quart for 100 hills	Aug. to Sept.
Beets	....	....	May to August	....	½ inch	....	....	18 inches	....	1 ounce for 50 feet	July to Sept.

Planting Table for Vegetables—(*Continued*)

Variety	When to Sow the Seed			When to Set Out Started Plants	Depth Seeds Should be Sown	Distance Apart in the Row	Distance Between the Rows	Distances when Planted in Hills or Drills		Amount of Seed Required	Season of Crop
	Indoors	Hotbeds	Outdoors					Between Drills	Between Hills		
Brussels Sprouts	March	April	May	May to June	⅛ inch	18 inches	2 feet	....	....	1 ounce for 2,000 plants	October
Cabbage, Early	March	March	May	May to June	⅛ inch	12 inches	2 feet	12 inches	....	1 ounce for 2 000 plants	July to Aug
Cabbage, Late	....	April	May	July	½ inch	24 inches	3½ feet	12 inches	....	1 ounce for 2,000 plants	Aug. to Oct.
Carrots	....	....	May to June	....	Raked into surface	....	18 inches	18 inches	....	1 ounce for 100 feet	July to Oct.
Cauliflower, Early	....	April to May	May	May	⅛ inch	24 inches	4 feet	....	....	1 ounce for 2,000 plants	July
Cauliflower, Late	....	....	June	July	½ inch	24 inches	4 feet	....	....	1 ounce for 2,000 plants	September
Celery	....	April	May	July	⅛ inch	10 inches	3 feet	12 inches	....	1 ounce for 2,000 plants	Sept. through winter
Chard, Swiss	....	....	Same as Beets	....	....	....	....	....	....	....	....
Corn, Sugar	....	April to May	May to June	May to June	1½ inches	12 inches	3 feet	3 feet	3 feet	1 quart for 100 hills	Aug. to Oct.
Cress, or Pepper Grass	....	....	April to July	....	Barely cover	Thick	12 inches	12 inches	....	1 ounce for 50 feet	July to Oct
Cucumber	March	April	May to June	May to June	½ inch	....	....	....	4 feet	3 plants in hill	Aug. to Oct.
Dandelion	....	....	April to June	....	¼ inch	3 inches	12 inches	18 inches	....	1 ounce for 1,000 plants	Following April to July
Eggplant	February to May	March to May	....	June	¼ inch	8 inches	24 inches	....	....	1 ounce for 1,000 plants	Aug. to Sept
Endive	....	....	May to July	June to July	Barely cover	10 inches	24 inches	....	....	1 ounce for 150 feet	Sept. through winter

Planting Table for Vegetables—(*Continued*)

Variety	When to Sow the Seed			When to Set Out Started Plants	Depth Seeds Should be Sown	Distance Apart in the Row	Distance Between the Rows	Distances when Planted in Hills or Drills		Amount of Seed Required	Season of Crop
	Indoors	Hotbeds	Outdoors					Between Drills	Between Hills		
Kale, for Fall	....	....	May to June	....	½ inch	12 inches	24 inches	....	....	1 ounce for 150 feet	September
Kale for Spring	....	....	September	....	½ inch	6 inches	18 inches	....	....	1 ounce for 150 feet	May
Kohl-Rabi	....	May to June	May to June	June	½ inch	6 inches	18 inches	....	....	1 ounce for 200 feet	Aug. to Sept.
Horse-radish Roots	....	....	....	May	3 inches	18 inches	30 inches	....	....	1 root a plant	Fall
Lettuce	February to March	March to April	May to August	May to August	¼ inch	12 inches	18 inches	18 inches	....	1 ounce for 120 feet	June to Oct.
Lettuce, Romain	....	....	May to June	Thin out	¼ inch	10 inches	15 inches	18 inches	....	1 ounce for 100 feet	Aug. to Oct.
Muskmelon	....	April to May	May to June	May to June	1 inch	....	....	....	5 feet	10 seeds or 3 plants in hill	Aug. to Oct.
Watermelon	....	....	May to June	....	1 inch	....	....	....	6 feet	....	Sept. to Oct.
Mushroom Spawn	....	....	....	In lawn during June, July	6 inches	....	....	....	3 feet	....	Aug. to Sept.
Martynia	....	April to May	May	May	½ inch	....	....	....	3 feet	....	Sept. to Oct.
Mustard	....	March	April to May	....	¼ inch	Thick	6 inches	....	....	1 ounce for 80 feet	May to Aug.
Okra	....	....	May	....	1 inch	....	....	....	2½ feet	3 plants in hill	September
Onion, Seed	....	....	April to May	....	½ inch	2 inches	12 inches	....	....	1 ounce for 100 feet	Aug. to Oct.

Planting Table for Vegetables—(*Continued*)

Variety	When to Sow the Seed			When to Set Out Started Plants	Depth Seeds Should be Sown	Distance Apart in the Row	Distance Between the Rows	Distances when Planted in Hills or Drills		Amount of Seed Required	Season of Crop
	Indoors	Hotbeds	Outdoors					Between Drills	Between Hills		
Onion, Sets	....	....	....	April to June	1 inch	3 inches	12 inches	....	....	1 quart for 50 feet	June to Sept.
Parsley	March	March to May	May	May	½ inch	8 inches	15 inches	....	....	1 ounce for 150 feet	June to Oct.
Parsnip	....	....	April	....	½ inch	6 inches	15 inches	....	....	1 ounce for 200 feet	Fall or early spring
Peas, Early Smooth	....	....	March to April	....	4 inches	Thick	3 feet	3 feet	....	1 quart for 100 feet	June
Peas, Early Wrinkled	....	....	April to May	....	2 inches	Thick	3 feet	3 feet	....	1 quart for 100 feet	July
Peas, Medium or Late	....	....	May to July	....	2 inches	Thick	4 feet	4 feet	....	1 quart for 100 feet	July to Sept.
Pepper	March	March to April	May	June	¼ inch	2 feet	3 feet	3 feet	....	1 ounce for 2,000 plants	Aug. to Sept.
Potato	....	....	....	April	4 inches	12 inches	3 feet	3 feet	3 feet	1 peck for 100 hills	Aug. to Oct.
Pumpkin	....	....	....	June	½ inch	....	....	....	6 feet	3 seeds to a hill	Sept. to Oct.
Radish	February	March to April	April to May	....	½ inch	2 inches	10 inches	12 inches	....	1 ounce for 100 feet	May to Oct.
Rhubarb, Roots	....	....	....	May	6 inches	3 feet	3 feet	3 feet	3 feet	....	May to July
Salsify	....	....	April to May	....	1 inch	5 inches	12 inches	12 inches	....	1 ounce for 50 feet	Sept. through winter
Spinach, for Summer	....	....	April to June	....	½ inch	3 inches	12 inches	12 inches	....	1 ounce for 100 feet	May to Aug.

Planting Table for Vegetables—(*Continued*)

Variety	When to Sow the Seed			When to Set Out Started Plants	Depth Seeds Should be Sown	Distance Apart in the Row	Distance Between the Rows	Distances when Planted in Hills or Drills		Amount of Seed Required	Season of Crop
	Indoors	Hotbeds	Outdoors					Between Drills	Between Hills		
Spinach for Spring	....	....	August to September	....	½ inch	Cover with	coarse litter	during	winter	1 ounce for 100 feet	March to May
Squash	....	....	May to June	....	1 inch	....	....	....	5 feet	3 plants in hill	Aug. to Oct.
Tomato	February	February to April	May	May to June	¼ inch	3 feet	3 feet	3 feet	3 feet	1 ounce for 1,000 plants	Aug. to Oct.
Turnip	....	....	May and July	....	½ inch	4 inches	18 inches	18 inches	....	1 ounce for 150 feet	Aug. to Oct.

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Largest yield from a 4 x 8 foot plot was:—
4 bunches of radishes.
½ bushel of lettuce.
2 qts. beans.
1 pk. beet greens.
½ pk. beets.
1 pk. carrots.

A Cleveland school garden, 1905.

Produce on 10 x 30 foot plot, June 26th—Oct. 7th. The plot was planted May 11th, 18th, and 25th. Radishes and lettuce were picked before June 26th when this record began.

June 26th
- Radishes 10
- Turnips 1
- Spinach ..... ⅛ pk.

June 30th
- Radishes 33
- Turnips ..... 1 qt
- Pansies 34
- Verbenas 88
- Lettuce ..... 1 head

July 3rd
- ½ pk. Spinach
- ½ pk. (scant) Swiss Chard
- 24 Pansies

July 5th
- 1 pt. Peas
- ¼ pk. Spinach

July 7th
- ½ pk. Swiss Chard
- 35 Pansies

July 16th
- 7 Beets
- 1 head Lettuce
- 63 Pansies

July 17th
- 2 qts. Peas
- 6 Beets
- 2 heads Lettuce

July 21st
- 2 qts. Wax Beans
- ½ pk. Swiss Chard

July 24th
- 1 qt. Peas
- 1 qt. Beans
- 5 Carrots
- ¼ pk. Swiss Chard
- 2 heads Lettuce
- 143 Pansies

July 28th
- 3 Peppers
- 1 qt. Peas
- ¼ pk. Swiss Chard
- 2 qts. Beans
- ½ pt. shelled Beans
- 1 Squash
- 150 Pansies
- 2 heads Lettuce

July 30th
- 13 Carrots
- 2 heads Lettuce

Aug. 2nd
- 3 Carrots

Aug. 7th
- 1 pk. Swiss Chard
- 1 Squash
- 2 Cucumbers
- 1 Pepper
- 1 Tomato
- 5 heads Lettuce
- 1 Carrot
- 100 Pansies

Aug. 11th
2 Squash
2 Cucumbers
1 Tomato
7 ears Corn
75 Pansies
Aug. 15th
11 ears Corn
8 Tomatoes
1 head Lettuce
Aug. 18th
6 ears Corn
1 Squash
4 Cucumbers
10 Tomatoes
1 pk. Swiss Chard
Aug. 22nd
2 Cucumbers
7 Tomatoes
3 ears Corn
Aug. 25th
3 Squash
8 Tomatoes
4 Cucumbers
1 pk. Swiss Chard
10 ears Corn
Aug. 28th
2 Cucumbers
3 Squash
½ pk. Swiss Chard
Sept. 1st
3 Tomatoes
1 Cucumber
1 pt. Peas
Sept. 3rd
¼ pk. Swiss Chard
2 Cucumbers
3 Tomatoes
1 Pepper
3 Squash
Sept. 7th
Dug the Potatoes
3 Squash
3 Cucumbers
1 pk. Potatoes
13 Turnips
7 Radishes
5 Tomatoes
Sept. 15th
10 Squash
2 Tomatoes
12 Radishes
4 heads Lettuce
10 Turnips
Sept. 22nd
9 Squash
4 heads Lettuce
Sept. 29th
3 heads Cabbage
4 heads Lettuce
¼ pk. Swiss Chard
5 Peppers
Oct. 7th
2 Squash
1 head Cabbage
6 Peppers

A few squash were left in the garden. Record of plot, School of Horticulture, Hartford.

The average yield from the plots of the school 8 by 16 feet, was 496 radishes, 21 beets, 2¼ pecks of beans 15 heads of lettuce, 22 turnips, 202 tomatoes, and 1 quart of lima beans. One hoe was stolen, the only loss during the entire season. There were hundreds of applicants for plots for the next year. Gambling and rioting have disappeared from the neighborhood, there have been fewer arrests than before, and

the college settlement, a block away, reported that "never had there been a summer so peaceful."

(Jewell, J. R., Agricultural Education, 1907.)

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YONKERS SCHOOL GARDENS

Suggested Program*

Purpose

1. To retain influence on children through the year.
2. To make garden work continuous.

Methods

1. *Garden work*—Greenhouse and cold frames.
   Slips, cuttings, bulbs, perennials, flats.
   All methods of propagation.
   Window boxes and potting.
   Gathering of seeds, roots and slips.
   Preparation for next season's work.
   Renovating of tools, markers, varnishing, etc.
   Sorting and measuring of seeds.
   Homemade envelopes.
   Help for home gardens, in measuring seeds.
   Lectures: Market product, commercial food stuffs, trees, farms, farming, domestic animals, etc., pests, cocoons, etc.
2. *Playground*—The garden after closing in fall, to be at once ploughed and harrowed and used as playground for four months.
   Free play, group games, fair play.
   Football, slides, skating, snow forts and warfare.

* Courtesy of Mrs. Arthur Livermore.

Making of simple apparatus.
Kite flying and making of flying toys.

3. *Club House*—To make Yonkers a *Garden City.*
"Clean city" clubs:—Talks on use and care of parks and trees.
Hygiene talks, illustrated by plants.
Simple civics—simple sanitation.
Sanitary League talks.
Manufacture of "box furniture."
Music.

THE CLUB HOUSE

1st floor—One large audience hall—for lectures and lantern and music—pianola.

2nd floor—1. Reading room—papers, magazines and books.
2. Game room.
3. Model housekeeping room—Teach washing, ironing, sweeping, dusting, chamber work, vegetable preparation and cooking.
4. Class rooms.

3d floor—For caretakers.

APPENDIX B

ADULT TESTIMONY

Mrs. Edith Goodyear Alger.

"In a school garden properly conducted children become so deeply interested in accomplishing a certain, definite, near and understandable result—the raising of flowers and vegetables—that they learn to work hard without being conscious of effort. This is a matter of the highest importance in educating children."—Vermont Circulars of Educational Information, No. XIII.

The American Civic Association has "the firm conviction that there is no more potent influence for better civic conditions in America than the educated youth, in whom there is developed this critical discernment of beauty and excellence in nature and art, an abiding love for these things, and a feeling of personal responsibility for better civic conditions. Furthermore, its members are firmly convinced that there is no more efficient agency for the attainment of those high ideals in education than school garden work, properly correlated with other school work."

Dr. W. A. Baldwin, President Normal School, Hyannis, Mass.

"I know of no form of work which has thus far been introduced into our schools that is helping

so much as is the school garden, toward the development of the latest and best thought in pedagogy. Schools are not to teach a preparation for life, but living itself, and that means the greatest unfolding of the soul through reaction upon environment, physical, industrial, social. The school garden gives many opportunities for such unfolding. Certainly the school garden is an instrument of sound education.

"If it is to accomplish all that it should, it must be work not play; it must be to the child, in some degree, what the farm is to the farmer; it must be planned and conducted with the idea that it is to yield a fair return for the labor that is put into it, and that the child who does the work is to reap the reward of his labors. Such a garden will make the child industrious, thoughtful and sympathetic."—Hyannis Normal School Catalogue, 1907, page 30.

Miss Mary Marshall Butler, President of the Women's Institute, Yonkers, N. Y.

"Our School Garden has convinced me that this form of outdoor education is a rational and proper sequence in the development of manual training. As some one has aptly said, 'we need the shop, the kitchen and the garden to cover completely industrial education.' The necessity for industrial or manual training, not only because of its practical application to life but also because of its stimulus to the brain, needs no argument.

"Our Yonkers garden has convinced me that it is a blessing to the child and to society, and that it contains many elements of educational, social and economic value."—Letter.

Dr. Otis W. Caldwell, Chicago University. Founder of the first school garden in Illinois at the Charleston State Normal School.

"One of the most important relations that the garden bears to natural history work in general exists in the opportunity it presents for organizing a considerable part of the materials of natural history. . . . It offers, furthermore, an introduction to nature, first through economic plants, the ones best known and most closely associated with the home and social life."—*The Normal School Bulletin*, Jan., 1908.

Charles L. Coon, Superintendent of Education, North Carolina.

"The garden is necessary because it furnishes a combination of hand work and book work that promotes thinking and observation."—"The School Garden." (Leaflet.)

R. H. Cowley, author of Macdonald School Gardens.

"Through the work of the school garden the pupil's powers of observation are turned into the orderly channels of cause and effect. His ever widening outlook toward the objects and forces of nature frees his mind from the power of sensory

illusions and his moral nature from superstitions. Habits of accuracy are formed in measuring the value of experiments according to the results obtained. In noting carefully and with deep interest both causes and effects, in assuming responsibility for work that he performs in equal opportunity with his companions, in daily exercising his power of initiative, in constantly combining thought and action, he is steadily developing elements of character that must prove of great value in after life. The good influence of the school garden on the discipline and moral tone of the school is remarked by all the teachers. Pupils hitherto troublesome have become orderly and docile. The percentage of regularity in attendance has increased, and a deeper interest is taken in all work of the school."—"The Macdonald School Gardens," in *Queen's Quarterly*, page 417.

Professor J. G. Coulter and Miss Alice Jean Patterson, Department of Nature Study, State Normal University, Normal, Ill.

"To relate nature study to human interest is sound pedagogy, for intelligence in what relates to living should be a fundamental in education.

"The school garden, probably more than any other phase of nature work, seems to supply a natural demand irrespective of locality. It has a definite mission to fulfil in the city as well as in the village and rural school."—*The Normal School Quarterly*, Jan., 1909.

Dick J. Crosby, of the Office of Experiment Stations, Washington.

"Experience has shown that devoting four or five hours a week, or even two hours a day, to nature study and gardening, if properly conducted, enables the pupils to accomplish more in the remaining time than they formerly accomplished in the whole time spent in school."—American Civic Association, Dept. of Children's Gardens, Leaflet No. 1.

Dr. Benjamin Marshall Davis, Miami University, formerly of the State Normal School, Chico, Cal., and author of "School Gardens for California Schools."

"The greatest value of these gardens lies in making up to the city child somewhat for the fact that contact with nature is almost wholly left out of his life. They form the basis of the most practical sort of nature study possible in cities. In many cases, no doubt, the amount of money spent for charts and other so-called aids to study, would be sufficient to cover the expense of a garden. But such an investment in a garden would be a clear educational gain because much of the illustrative material for geography and other subjects would be prepared by the children."—"School Gardens for California Schools," page 9.

President Eliot of Harvard, says: "A leading object in education for efficiency is the cultivation

of the critical discernment of beauty and excellence in things, and words, and thoughts, in nature, and in human nature."—"Education for Efficiency," page 18.

George D. Fuller, University of Chicago. Director of the first Macdonald school garden in Broome County, Quebec.

"In some schools there has been a very noticeable change in the attitude of the pupils toward the schoolroom and grounds, and they now take pride in beautiful surroundings and care for them where formerly they sought but to make desolation more hideous.

"As the pupils have planned their plots, have measured and staked them out, planted the seed and cared for the plants, they have become more skilful of hand and more accurate of eye, while working from a definite plan has trained the judgment and taught them to foresee the future. All these results would warrant the existence of school gardens, but more noticeable has been the response to the appeal made to the higher nature of the child."

"The pupils' attention has been turned to a consideration of the beautiful to the exclusion of many baser thoughts, and the resulting moral culture has found expression in more orderly behavior."—"The School Garden and The Country School," pages 46 and 246.

B. F. Galloway, Chief of the Bureau of Plant Industry, United States Department of Agriculture.

"It is desirable, where it can be made a class exercise, that school time be devoted to this work, for when done after hours it is necessarily voluntary, and those who do not volunteer are often the ones it is especially desirable to reach."—"School Gardens," U. S. Bulletin No. 160, Office of Experiment Station, page 43.

"In the school garden the fact should always be kept prominent that the pupil is to be the most active factor. We can put things in his way to help him develop properly and keep him from some of the things that fail so to help him, but we cannot do his developing for him, and if he is to have a knowledge of the elementary principles of life, of industry, of mankind, of beauty and justice, he must grow into these things by means of first hand experience with them. To obtain this growth and to eliminate some undesirable things in the school, the school garden should certainly prove efficient."—"School Gardens," U. S. Bulletin No. 160.

The Gardening Association of America, "organized for the development of school gardening and other activities tending to occupy the people and train them to the best use of land for their intellectual, material and physical betterment"

includes in its membership both individuals and associations that are interested in promoting home and school gardens. It includes in its board of governors such people as Mr. Bolton Hall, Pres. Haines of the Home Gardening Association, Cleveland; Mr. Samuel Fels, Dr. C. F. Hodge, Miss Louise Klein Miller, Mrs. L. L. Wilson, of the Philadelphia Normal School; Dr. Crapsey, of Rochester, and Mr. R. F. Powell, of the Buffalo Vacant Lot Association.

Dr. C. F. Hodge, Clark University.

"The same thinking, willing, doing, the same patience that enter into care of the plant or the fledgling bird will later enter into the care of home and children."—Speech at Session of Conference on Prevention of Infant Mortality, New Haven, Nov. 11, 1909.

"A school garden can also supply ethical culture where it is most needed."—"Nature Study and Life," page 130.

E. A. Howes, Principal of Macdonald Consolidated School, Guelph, and Director of the first Macdonald School Garden at Bowesville, Ontario.

"I am ready to put myself on record as saying that the school garden has relieved much of the drudgery of the school work to which I was always accustomed. This year we had our school garden

and it has been the pleasantest year of my school work. I would never again pass a summer without a school garden. The child's mind gets growth out of it because it is something it can understand. Not only does the School Garden serve well as a means of educating and training the child, but it supplies a class of knowledge that is highly useful and cultivates a taste for an honorable and remunerative vocation."—Letter.

James Ralph Jewell, Author of "Agricultural Education including Nature Study and School Gardens."

"The importance of school gardens is indicated by the impetus given them from so many sides, by the fact that they are not in any way the fad of some one class of people, but that they are used —and successfully used—by organizations with widely different purposes to further their own aims and to solve the problems of special interest to them." (Page 37.)

"The district nurses of some of our American cities report much better health among children at work in school gardens than before such work was undertaken—a thing of no inconsiderable importance to us as a people." (Page 121.)

"College settlements in all the cities have lent their aid, and everywhere local agricultural and horticultural societies have given at least moral support. The committee of five of the National Educational Council has attested to the value of a

garden with every school. The American Civic Association has organized a department of children's gardens." (Page 38.)

"The American Institute of Social Science is conducting a propaganda for the establishment of schools for children of weak and undeveloped constitutions where power of resistance is small, where the buildings shall be surrounded by trees and where gardening shall be a particular feature." (Page 120.)—"Agricultural Education."

"Practical ethics are best insured by making every citizen, at least potentially, a producer. For example, a small, well-managed farm school has proved more successful than any other means for reforming boys with criminal tendencies." (Page 126.)

"The ethical value of producing something cannot be overestimated; in this lies the only road to altruism open to the child, as well as a guaranty of his respect for the products of others." (Page 125.)

"Country children have become interested in the science of their future life occupation, and so they have been taught to think for themselves and to respect their calling. Children have been taught through these gardens more about practical ethics than by any other means yet devised, besides learning something of the fundamental occupation of mankind—tilling the earth." (Page 46.)

"In rural schools where other forms of manual training are perhaps out of the question for the present, practical agricultural work supplies the motor training needed by all and essential to the motor minded." (Page 125.)

"School gardens possess all these advantages of manual training, with the added ones, over some forms of this discipline, of their feasibility almost anywhere, of easier inculcation of the sense of ownership, of working with the fundamental instead of the mere accessory muscles, and of being essentially out-of-door work." (Page 41.)

"School gardens have the advantage over all other school work of promoting the health of the child, especially in cases of incipient tuberculosis." (Page 125.)

Finally, to quote once more from Mr. Jewell's investigation concerning agricultural education:

"A study of the laws of nature may well teach one that 'whatsoever a man soweth, that shall he also reap,' in his life as well as from the soil. In working through a long season, side by side with others, the child gets his earliest and best instruction in social responsibilities, in what he owes to his neighbor, one of the most important things an individual of to-day has to learn."—(Page 118.)—"Agricultural Education."

Miss Dora Keen, Vice-President, The Public Education Association of Philadelphia.

"(1) To teach children to learn by observation, and to give them practical training by the eye and the hand.

(2) To teach children to apply what they learn from books, as to nature study, mensuration, and other subjects, without the strain of additional indoor work.

(3) To influence character by appeal to their love of nature.

(4) To prepare children for citizenship by teaching, practically, the care of private and public property.

(5) To mould character by demanding independence, each child being dependent upon himself in a garden for the results of his labor.

(6) To impress practically and theoretically the law of sequence, one event proceeding from another as its direct consequence.

(7) To educate the emotions, by teaching care and protection of tender growing things.

A GARDENER, no matter how excellent, will not be as competent as an experienced teacher to carry out these educational purposes of school gardens."—Report of the Public Education Association of Philadelphia, 1905.

A. W. Leech, Day School Inspector, Rosebud Indian Agency.

"These people (the Indians) have never fol-

lowed agriculture and in their primitive state depended entirely on the chase, thus differing from many of the tribes of the east and the south. It is to change them from this manner of living that the school and *school garden* are instituted among them."—Letter.

Edward Martin, Director Public Health and Charities, Philadelphia, writes: "In the slums of Philadelphia I have found that in the houses where there are flowers—a result of our school gardens—there is neat cleanliness, although all around is squalor."

"School gardens in the slums of a number of cities have taught more civic righteousness than all the police courts or college settlements have been able to do."—Quoted in Keen's "Philadelphia School Gardens."

Miss Louise Klein Miller, Curator of School Gardens, Cleveland, Ohio.

"The work of gardening is all wholesome and conducive to making better, stronger boys and girls and more industrious, law-abiding citizens."—"Children's Gardens," page 71.

"Experience has taught that this is the best possible kind of work for this (defective) class of children. It opens a new avenue for future occupation."—Letter.

"It ministers directly to physical well-being; helps to establish habits of punctuality, regularity

and constancy; reveals executive ability in those who superintend; and arouses a desire to improve the home grounds."—Home Gardening Association Report, 1906, page 9.

Dr. James W. Robertson, President of Macdonald College, Ste. Anne de Bellevue, Quebec, Canada.

"When a child does anything with its own hands, such as planting a seed, pulling up a plant, making examination of the changes which have taken place during its growth, making a drawing of it, mounting it and putting its name on it, he receives impressions by the sense of touch, he sees, he hears the noise of the movements he makes, and he smells the soil and the part of the plant with which he is dealing. Those impressions are definite and lasting; they add to the sum of sensuous knowledge; they prepare for the perception of logical knowledge, in a common sense way."—"Macdonald Fund for Manual Training and the Improvement of Rural Schools," page 43.

"Since engaging in the work my boys and girls have been first in all examinations, competing with children from other schools, including city schools. The whole tone of the school has been improved morally, socially, and esthetically. Our boys and girls have now a reverence for life unknown before, and it has awakened in them, as

nothing else could do, a deeper interest in all life around them." (Page 197.)

"The best education in rural schools should make the people like rural life and also enable them to make it more profitable. The best way to make any workman like his work is to make him understand it. The school garden is one way of making rural life more popular as well as efficient."—"The Macdonald Movement for Rural Education," page 193.

Erasmus Schwab, Vienna. Founder of the movement, and author of "The School Garden," 1855.

"A proper school garden may, must and is destined to be the place where children are happiest; it must be the dearest spot in those hours which they do not spend in the schoolroom or occupy at home in work for the school."—"The School Garden," page 22.

APPENDIX C

HOW TO PLANT A TREE*

I. *Dig the hole wider and deeper than the tree requires.* If the tree just fits into the socket the tips of the roots will meet a hard wall which they are too delicate to penetrate, hold fast to, or feed in.

II. *Be sure that the surface soil is hoarded at one side when the hole is dug.* This soil is mellow and full of plant food. The under soil is harder and more barren. Some rich garden soil can well be brought over and used instead of the subsoil.

III. *Take up as large a root system as possible with the tree you dig.* The smaller the ball of earth, the greater the loss of feeding roots and the danger of starvation to the tree.

IV. *Trim all torn and broken roots with a sharp knife.* A ragged wound below or above the ground is slow and uncertain in healing. A clean, slanting cut heals soonest and surest.

V. *Set the tree on a bed of mellow soil with all its roots spread naturally.*

VI. *Let the level be the same as before.* The tree's roots must be planted, but not buried too deep to breathe. A stick laid across the hole at the ground level will indicate where the tree "collar" should be.

VII. *Sift rich earth, free from clods, among the*

* Rogers, Julia E.: The Tree Book. By permission of Doubleday, Page and Company.

roots. Hold the tree erect and firm; lift it a little to make sure the spaces are well filled underneath. Pack it well down with your foot.

VIII. *If in the growing season, pour in water and let it settle away.* This establishes contact between root hairs and soil particles, and dissolves plant food for absorption. If the tree is dormant do not water it.

IX. *Fill the hole with dirt.* Tramp in well as filling goes on. Heap it somewhat to allow for settling. If subsoil is used, put it on last. Make the tree firm in its place.

X. *Prune the top to a few main branches and shorten these.* This applies to a sapling of a few years whose head you are able to form. Older trees should also be pruned to balance the loss of roots. Otherwise transpiration of water from the foliage would be so great as to overtax its roots, not yet established in the new place. Many trees die from this abuse. People cannot bear to cut back the handsome top, though a handsomer one is soon supplied by following this reasonable rule.

XI. *Water the tree frequently as it first starts.* A thorough soaking of all the roots, not a mere sprinkling of the surface soil, is needed. Continuous growth depends on moisture in the soil. Drainage will remove the surplus water.

XII. *Keep the surface soil free from cakes or cracks.* This prevents excessive evaporation. Do not stir the soil deep enough to disturb the roots. Keep out grass and weeds.

APPENDIX C

TEN PRINCIPLES OF PRUNING*

1. Pruning the roots lessens the food supply, and so retards top growth.

2. Pruning the top invigorates the branches that remain, the root system being unchanged.

3. Removing terminal buds induces forking, thus thickening the branching system. It checks wood production, and encourages the production of fruit and flowers.

4. Unpruned trees tend to wood production.

5. Summer pruning reduces the struggle among leaves and twigs for light and produces stronger buds for spring.

6. Winter pruning removes superfluous buds, inducing greater health in those that are left to develop.

7. Dead wood should be taken out at any season and burned.

8. The best time to prune, generally speaking, is just before the growth starts in the spring.

9. Early winter pruning is undesirable because the healing of wounds must wait until spring.

10. Yearly pruning is better than pruning at less frequent intervals.

* Rogers, Julia E.: The Tree Book. By permission of Doubleday, Page and Company.

APPENDIX D

A HYMN FOR ARBOR DAY

By Henry Hanby Hay

God save this tree we plant!
And to all nature grant
  Sunshine and rain.
Let not its branches fade,
Save it from axe and spade,
Save it for joyful shade—
  Guarding the plain.

When it is ripe to fall,
Neighbored by trees as tall,
  Shape it for good.
Shape it to bench and stool,
Shape it to square and rule,
Shape it for home and school,
  God bless the wood.

Lord of the earth and sea,
Prosper our planted tree,
  Save with Thy might.
Save us from indolence,
Waste and improvidence,
And in Thy excellence
  Lead us aright.

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BIBLIOGRAPHY

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A FREE SCHOOL GARDEN LIBRARY*

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185. Beautifying the Home Grounds. 24 pages
134. Tree Planting in Rural School Grounds. 32 pages
157. The Propagation of Plants. 24 pages
25. Peanuts: Culture and Uses. 24 pages
28. Weeds: And How to Kill Them. 30 pages

* Copies will be sent free to any address in the United States on application to a Senator, Representative or Delegate in Congress, or to the Secretary of Agriculture, Washington, D. C.

Many of the state agricultural colleges issue similar series, sometimes for sale outside the states. To give a complete list would exceed the limits of this bibliography, but on page 347 certain important pamphlets issued by the Massachusetts State Board of Agriculture and by the Hampton Institute, Virginia, are given as indicative not only of the garden work done in these two localities but of the subject matter that may be expected from local state authorities. Title lists can usually be had upon application.

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62. Marketing Farm Produce. 28 pages
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73. Country Life Education. 13 pages
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Circulars

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* This is out of print as a free document, but may be had for 10 cents by applying to Superintendent of Documents, Washington, D. C.

A list of many valuable documents that are for sale at from 5 cents to 25 cents apiece, may be had upon application.

MASSACHUSETTS STATE BOARD OF AGRICULTURE

Nature Leaflets (Address State House, Boston, Mass.)

The leaflets usually contain 2 to 4 pages and are free within the state. They cost 2 cents each to those outside the state. Among them are the following:

No.

1. Canker Worms
2. Tent Caterpillar
4. Insecticides, Fungicides, and How to Make Them
5. The White Marker Tussock Moth
6. The Spiny Elm Caterpillar
8. The May Beetle, also Ants Indoors and Out
15. Bird Houses
17. Bordeaux Mixture
18. Plant Lice or Aphids
19. Edible Weeds and Pot Herbs
20. Massachusetts Weeds
22 & 25. Hints on Outdoor Bird Study
26. Browntail Moth
27. Gipsy Moth
28. The Garden Toad
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HAMPTON NATURE STUDY BUREAU

(Hampton Institute, Hampton, Va)

AGRICULTURAL LEAFLETS

1. Plants
2. Soils
3. Farm Manures
4. Commercial Fertilizers
5. Plowing, Harrowing and Rolling
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7. Notes on Soil Moisture

No.
8. Rotation of Crops
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(Well illustrated and always helpful)

LAIDLAW, MARGARET C.: School Gardens. *Kindergarten Review*, Sept., 1904

LATTER, LUCY: School Gardening for Little Children. Swan, Sonnenschein and Co., London, 1906. $ .75

(One of the best books, especially for little children)

ROBERTSON, JAMES W.: Macdonald Movement for Rural Education and Other Addresses. By the President of Macdonald College, Ste. Anne de Bellevue, Quebec, Canada.

(Extremely practical and forceful arguments for improvement of rural schools; for a curriculum suited to an agricultural community; and for the benefit to be derived from school gardens)

MILLER, LOUISE KLEIN: Children's Gardens. D. Appleton and Co., New York, 1908. $1.25

(Really descriptive of gardens in connection with schools. One of the best books published. Miss Miller is Curator of Gardens in the public schools of Cleveland, and jointly with the Cleveland Home Gardening Association has initiated a far reaching and forceful work)

MORLEY, MARGARET W.: Flowers and Their Friends. Ginn and Co., Boston, 1897. $ .60

(Delightful stories for little folks about the morning glory, the geranium family, the hyacinth and the general structure of flowers)

Seed Babies. Ginn and Co., Boston, 1896. $ .30

(Catchy stories for little folks, such as "This is the flower so bright and gay" after "The house that Jack built")

PARSONS, HENRY G.: Children's Gardens for Pleasure, Health and Education. Sturgis and Walton, New York. $1.00

(Announced for April, 1910)

PARSONS, MRS. HENRY M.: Report of the Children's Farm School of DeWitt Clinton Park, 1902–1904

Annual Reports of the Children's International School Farm League, 1907–1909

Reports of Cleveland Home Gardening Association. Address the Secretary, 501 St. Clair Ave.

("The Home Gardening Association aims to make the city beautiful. It strives to interest larger numbers of people in the task. This is done through the distribution of seeds in penny packets, through illustrated lectures, through school, training and vacant lot gardens. Thirty thousand families in Cleveland, as well as schools and civic organizations in more than one hundred other cities and villages participate in the work." See also in connection with these the reports of the Cleveland Board of Education for school garden work in that city.)

SCHWAB, ERASMUS: The School Garden (1855). Translated by Mrs. Horace Mann, 1879. M. L. Holbrook, New York, 1879. $ .50

(The earliest book on the subject and by the founder of the school garden in Europe. Still a classic)

SIPE, SUSAN B.: School Gardening and Nature Study in English Rural Schools and in London. U. S. Dept. of Agric., Office of Exp'm't Stations, Bulletin No. 204

(Showing what can be done under the hardest city conditions)

Tree Planting: School Gardens and Schoolroom Decoration in Nebraska. Report of Agricultural Exp. Station, Lincoln, Neb. Bulletin No. 55

(Excellent)

Weed, Clarence M.: Seed Travelers. Ginn and Co., Boston, 1902. $ .50

14 stories (7=The Wind as a Seed Distributor)
(5=Seed Dissemination by Birds)
(2=Seed Dispersal by Spines and Hooks)

Wilson, Mrs. Lucy Langdon Williams: Nature Study in Elementary Schools. The Macmillan Co., New York, 1907. A Manual for Teachers. $ .90

Nature Study in Elementary Schools
First and Second Readers. The Macmillan Co., New York, 1905–1909. Each, $ .35

(Use these three books together in the first four years of school life and later according to the requirements of the children in the school garden. The first presupposes no special training on the teacher's part nor special facilities for collecting material. The Readers lead to a love of good literature. Stories are arranged by months)

3. Books and Bulletins on Tree and Plant Life

Blanchan, Neltje: Nature's Garden. Doubleday. Page and Co., New York, 1909. $2.50

(Flowers described according to color)

The American Flower Garden. Doubleday, Page and Co., New York, 1909. $5.00

(Gardens described according to character, as formal garden, rock garden, old fashioned garden, etc. Both books admirably illustrated)

Brown, Kate Louise: The Plant Baby and its Friends. Silver, Burdett and Co., New York, 1909. $ .48

Cooke, Flora J.: Nature Myths. A. Flannagan Co., Chicago, 1909. Cloth bound, $ .35; paper bound, $ .25

Dana. Mrs. Wm. Starr (Mrs. F. T. Parsons): How to know Ferns. 1909. $1.50

How to know Wild Flowers. 1898. $2.00

According to Season. Charles Scribner's Sons. 1902. $1.75

Davey, John: The Tree Doctor. Saalfield Publishing Co., New York and Chicago, 1904

(Profusely illustrated)

Davis, B. M.: Experimental Studies of Plant Growth. The Miami Bulletin, Series VII, No. 1. Miami University, Oxford, Ohio, 1907

French, Allen: Book of Vegetables and Garden Herbs. The Macmillan Company, New York, 1907. $1.75

("Practical handbook and planting table for the vegetable gardener")

Hall, Bolton: Three Acres and Liberty. The Macmillan Co., New York, 1907. $1.50

The Garden Yard. David McKay, Philadelphia, 1909. $ .80

(Both show what can be accomplished on small areas of land)

Harrison, F. C.: The Weeds of Ontario. Dept. of Agriculture, Toronto

(Good in part for the United States)

Knobel, E.: Guide to find the Trees and Shrubs of New England by their leaves. Bradlee Whidden, Boston, 1894. Paper covered, $ .50

(Trees classified by the outline of their leaves; the outlines illustrated)

LOUNSBERRY, ALICE: The Garden Book for Young People. Frederick A. Stokes Co., New York, 1908

(A garden book in the form of a story of a young boy and an elder sister who make so good a garden that it interests the older people of the neighborhood also. The book includes much practical knowledge of garden work and something about birds)

A Guide to Wild Flowers. Frederick A. Stokes Co., New York, 1899. New Ed., 1902. $1.72

The Wild Flower Book for Young People. Frederick A. Stokes Co., New York, 1909. $1.50

A Guide to the Trees. Frederick A. Stokes Co., New York, 1902. $1.75

Southern Wild Flowers and Trees. Frederick A. Stokes Co., New York, 1909. $3.70

MATHEWS, SCHUYLER F.: The Beautiful Flower Garden. Orange Judd Co., New York, 1909

Familiar Trees and Their Leaves. D. Appleton and Co., New York, 1909. $1.75

Familiar Features of the Roadside (flowers, trees, insects, birds). D. Appleton and Co., New York, 1897. $1.75

Familiar Flowers of Field and Garden. D. Appleton and Co., New York, 1909. $1.40

NORTHRUP, ALICE R.: Flower Shows in City Schools. *Nature Study Review*, May, 1905

OSTERHAUT, W. J. V.: Experiments with Plants. The Macmillan Co., New York, 1906. $1.25

(Most useful in suggesting and devising simple plant experiments)

POWELL, E. P.: The Country Home. McClure, Phillips and Co., New York, 1904

(Chapters on flowers and vegetables)

Hedges, Windbreaks, Shelters, Live Fences. McClure, Phillips and Co., New York, 1900. $ .50

Roe, E. P.: The Home Acre. Dodd, Mead and Co., New York, 1909. $ .75

(Two chapters on the kitchen garden)

Rogers, Ellen R.: Trees every Child should Know. 48 ill. Doubleday, Page and Co., New York, 1909. $1.20

(Interesting to children)

Schauffler, Robert Haven: Arbor Day. Moffat, Yard and Co., New York, 1909. $1.00

("Its history, observance, spirit, significance; with practical suggestions on tree planting and conservation and nature anthology")

Smith, Eleanor: Songs for the Year. Silver, Burdett and Co., New York, 1909. 2 parts. Each $ .15

Songs of Life and Nature. Silver, Burdett and Co., New York, 1909. $1.25, also $ .75

Stone, Gertrude L., and Fickett, M. Grace: Trees in Prose and Poetry. Ginn and Co., Boston, 1909. $ .55

(Poetry of the common trees)

Tree Nurseries in School Gardens. *Country Life in America*, 1903, No. 6

Tree Planting, Methods of. Agr. Exp. Station, Lincoln, Nebr., Bulletin No. 56

Trees of Vermont. Agric. Exp. Station, Burlington, Vt., Bulletin No. 73

(Good for New England and New York)

Weed, C. M.: Ten New England Blossoms. Houghton, Mifflin and Co., Boston, 1909. $1.25

4. Books and Bulletins on Animal Life in the Garden

(a) Birds

Babcock, Charles A.: Bird Day and How to Prepare for it. Silver, Burdett and Co., New York, 1909. $.50

Badenoch, L. N.: Romance of the Insect World. The Macmillan Co., New York, 1909. $1.25

(Good for fourth to sixth grade children)

True Tales of Insects. E. P. Dutton. $3.00

Blanchan, Neltje: Bird Neighbors. Orange Judd Co., New York, 1909. $2.00

Bowdish, B. S.: Putting up of Bird Houses; How to make and where to place. Special leaflet, National Association of Audubon Societies. New York, 1908

Chapman, Frank M.: North American Birds. Doubleday, Page and Co., New York, 1909. $2.50

(Color key to the birds. Has over 800 illustrations)

Dickerson, Mary C.: The Frog book, or North American Frogs and Toads. Doubleday, Page and Co., New York, 1909. $4.00

(Over 400 illustrations)

Moths and butterflies. Ginn and Co., Boston, 1909. $2.50

Dugmore, Arthur R.: Bird Homes. Doubleday, Page and Co., New York, 1909. $2.00

Fifty common birds of Vermont. Dept. of Education, Circular XVIII, Montpelier, Vt.

(Prepared for teachers and school officers)

GRINNELL, ELIZABETH and JOSEPH: Our Feathered Friends. D. C. Heath and Co., Boston, 1909. Boards. $ .30

Birds of Song and Story. A. W. Mumford and Co., 1901. $1.00

MILLER, OLIVE THORNE: Bird Ways. Houghton, Mifflin and Co., Boston, 1885. $1.25

First Book of Birds. Houghton, Mifflin and Co., Boston, 1899. $1.00

Second Book of Birds. Houghton, Mifflin and Co., Boston, 1901. $1.00

Little Brother of the Air. Houghton, Mifflin and Co., Boston, 1892. $1.25

In Nesting Time. Houghton, Mifflin and Co., Boston, 1888. $1.25

Upon the Tree Tops. Houghton, Mifflin and Co., Boston, 1897. $1.25

True Bird Stories. Houghton, Mifflin and Co., Boston, 1903. $1.00

NASH, C. W.: The Birds of Ontario in relation to Agriculture. Dept. of Agric., Toronto

PEARSON, T. G.: Stories of Bird Life. Johnson Pub'g. Co., Richmond, Va., 1901. $ .60

(b) Insects

Butterflies and Moths injurious to our Fruit Producing Plants. Agr. Exp. Station, St. Anthony Park, Minn. Bulletin 61

COMSTOCK, ANNA B.: How to Keep Bees. Doubleday, Page and Co., New York, 1905. $1.00

COMSTOCK, JOHN H. and ANNA B.: Manual for the Study of Insect Life. J. H. Comstock, Ithaca, N. Y., 1906. $4.00

COMSTOCK, JOHN H.: Insect Life. D. Appleton and Co., New York, 1905. $1.50

("An introduction to nature study, and a guide for teachers, students and others interested in outdoor life." Better than the Manual for the average reader)

HOLLAND, W. J.: The Butterfly Book. Doubleday, Page and Co., New York, 1898. $3.00

HOWARD, L. O.: The Insect Book. Doubleday, Page and Co., New York, 1901. $3.00

Insects Injurious to Shade and Ornamental Plants. Agr. Exp. Station, New Brunswick, N. J. Bulletin No. 181

KIRKLAND, ARTHUR: Usefulness of the American Toad. Farmers' Bulletin No. 196

KNOBEL, E.: Day Butterflies and Duskfliers. Bradlee Whidden, Boston, 1895. Paper, $ .50

The Beetles of New England. Bradlee Whidden, Boston, 1895. Paper, $ .50

(Books easily slipped in the pocket; mostly illustrations, and convenient for identifying, but not reliable for all names. Used with Comstock as an authority in names, they are helpful)

MORLEY, MARGARET W.: Bee People. A. C. McClurg and Co. 1899. $1.25

Butterflies and Bees. Ginn and Co., Boston, 1909. $ .75

Insect Folk. Ginn and Co., Boston, 1903. $ .55

Little Wanderers. Ginn and Co., Boston, 1899. $ .30

PECKHAM, G. W. and E. G.: Wasps, Social and Solitary. Houghton, Mifflin and Co., Boston, 1905. $1.50

PIERSON, C. D.: Among Pond People. E. P. Dutton, New York, 1901. $1.00

REED, CHESTER A.: A Bird Guide. C. K. Reed, Worcester, Mass., 1905. 2 parts, each $ .75

Part I. Water, Game and Birds of Prey

Part II. Land Birds east of the Rockies

(The books are in flexible cloth 2¼ by 5¾ inches and contain over 200 illustrations in color. A good pocket guide)

Goldfish—Aquaria—Ferneries. Doubleday, Page and Co., New York, 1909. $ .50

ROGERS, JULIA E.: Life in an Aquarium. Cornell Leaflet No. 11

WEED, C. M.: Insects and Insecticides. 2d rev. ed., Orange Judd Co., New York, 1908

Life Histories of American Insects. The Macmillan Co., New York, 1906. $ .50

(Delightful stories to tell the children)

Nature Biographies. Doubleday, Page and Co., New York, 1901. $1.35

("The lives of some everyday butterflies, moths, grasshoppers and flies")

Fungi and Fungicides. Orange Judd Co., New York, 1894. $1.00

Stories of Insect Life: Series 1 and 2, 20 stories. Ginn and Co., Boston, 1897. $ .50

WRIGHT, MABEL OSGOOD: Heart of Nature Series. The Macmillan Co., New York, 1904. $ .50

(Including "Stories of plants and animals;" "Stories of earth and sky;" "Stories of birds and beasts")

5. THE SCHOOL GARDEN IN PERIODICAL LITERATURE

The most complete bibliography of the school garden was issued by Dr. B. M. Davis, now of Miami University, in his "School Gardens for California Schools," published by the Chico State Normal School, Cal., in 1904. Two hundred and fifty scattered articles are there enumerated. Since then, many others have appeared. The older list contains numerous pamphlets which are no longer accessible to

the reader. Some are obtainable at libraries where files of *Country Life, Suburban Life, The Garden Magazine, World's Work*, the Reports of the National Educational Association (N.E.A.), copies of the *Nature Study Review*, of the *Journal of Education*, files of reports of the horticultural societies and similar publications, and, finally, of the United States Bureau of Education, are kept. From Dr. Davis's list I have selected a few that seemed most likely and best fitted to repay a search or a trip to a large library. The best method for obtaining access to the constant outcrop of pamphlets bearing upon school-gardening is to keep in touch with national and state publication lists; publications of normal schools and colleges that are already known for excellent work; and those sent out by such societies as the American Civic Association.

(*a*) General references

American Civic Association: Suggestions for Beautifying the Home, Village and Roadway. Outdoor Art Dep't., Pamphlet No. 5

Window Gardening. By Herbert D. Hemenway. Dept. Pamphlet No. 1. 1905

Babcock, E. B.: Suggestions for Garden Work in California Schools. University of California, Agricultural Experiment Station. Circular 46. Berkeley, Cal., 1909

Bowles, J. M.: A Flower Garden for Every Child. *World's Work*, May, 1904

Coon, Charles L. (Editor): Geography, Nature Study and Agriculture in the Elementary Schools. A Manual for Teachers. Teachers' Bulletin II. Raleigh, N. C.

Davis, B. M.: What Constitutes Successful Work in Agriculture in Rural Schools. Report of Nat. Educ. Association, 1908

Dorner, Herman B.: Window Gardening in the School Room. Purdue University, Lafayette, Ind., 1905

Hemenway, H. D.: Hartford School of Horticulture. *Nature Study Review*, January, 1905

School, Rural, Study of Crops in the Fields. U. S. Dept. of Agriculture Yearbook, 1905

(Including agricultural study as aid to other school work; laboratory exercises and materials)

Window Gardening. American Civic Association. Outdoor Art Department, Pamphlet No. 1.

Stout Manual Training School (Menomonie, Wis.): 1899. A Handbook for Planning and Planting the Small Home Grounds

(b) From Bibliography by B. M. Davis

ADDIS, WELLFORD: Course in Agriculture in Higher
1889 Elementary Schools in France. U. S. Bureau of Education. Report of Commissioners for 1889–1890, Vol. 2, pp. 1007–1013

American Park and Outdoor Art Association.* Report
1903 of special school-garden session of the 7th annual meeting, Vol. 7, Part 3, pp. 1–54

(It contains report of standing committee on school grounds, which states:

"1. That the American Park and Outdoor Art Association acting through its committees, individual members, and affiliated organizations, lend its active support and encouragement to the beautification of school grounds and to the establishment and maintenance of school gardens and playgrounds for children.

"2. That, in pursuance of this end, the Association co-operate with city and school officials, local associations, and other organizations: and

"3. That the Association encourage the establishment and maintenance of courses of study in normal schools, agricul-

* The American Park and Outdoor Art Association no longer exists under this title. At St. Louis, Mo., June 10, 1904, the American Civic Association was formed by the merger of the American Park and Outdoor Art Association and the American League for Civic Improvement. All communications should now be addressed to American Civic Association, Union Trust Bldg., Washington, D. C.

tural colleges, and other like institutions of learning, such as will prepare teachers for work of this kind.")

(This report of special school garden session also contains reports on school gardens from twenty different states, and from Porto Rico and Hawaii)

BAILEY, L. H.: Hints on Rural School Grounds. Cor-
1889 nell University. Experiment Station Bulletin No. 160, pp. 271–290

1903 School Gardens. *Country Life in America*, Vol. 3, pp. 190–192. Doubleday, Page and Co.

1903 The Nature Study Movement. Journal of Proceedings and Addresses of the N. E. A., 1903, pp. 109–116

BALDWIN, W. A.: Industrial Training in Rural Schools.
1903 Journal of Proceedings and Addresses of the N. E. A., 1903, pp. 193–198

BARTHOLOMEW, A. C.: Gardening; Its Rôle in Prepara-
1900 tory School Life. London: British Board of Education, Special Reports, Vol. 6, pp. 321–325

BARTON, NELLIE: Lessons in Nature Study. Glen-
1902 wood, Ia. Institute for Feeble-Minded Children, pp. 25–29

BEARD, ANNIE E. S.: New Methods in School Gardens.
1904 *The World To-day*, Vol. 6, No. 5, pp. 675–681

BESSEY, C. E. et al.: New Elementary Agriculture.
1904 Lincoln, Neb. The University Pub. Co., 1903, pp. 10–194

("The school laws of Nebraska require teachers to pass a satisfactory examination in the elements of agriculture, including a fair knowledge of the structure and habits of the common plants, insects, birds, and quadrupeds, for second grade county certificates and all grades above the second. This book has been prepared and published in answer to the direct demand resultant from the law quoted above.")

BLAIR, J. C.: The Study of Horticulture: A series of
1902 1903 eight articles on various phases of the subject

adapted for use in public schools. *School News*, Taylorville, Ill., Oct., 1902, to May, 1903. Reprinted in the form of eight-page leaflets by publisher of *School News*, and sold at one cent each in quantities of ten or more

BRERETON, CLOUDESLEY: The Rural School of North-
1902 west France. London: British Board of Education, Special Reports, Vol. 7, pp. 9–14, 1–224

BRIGHT, ORVILLE T.: School Gardens, City School-
1903 yards, and the Surroundings of Rural Schools. Journal of Proceedings and Addresses of the N. E. A., 1903, pp. 77–85

CORBETT, L. C.: Plants as a Factor in Home Adorn-
1902 ment. U. S. Dept. of Agriculture. Yearbook, 1902, pp. 501–518

CROSBY, D. J.: School Gardens. *The Outlook*, Vol. 71,
1902 pp. 852–861

Children's Gardens. Prospectus of the Depart-
1904 ment of Children's Gardens of the American Civic Association, Washington. Department Leaflet No. 1, p. 8

("The department of Children's Gardens is one of the coördinate departments of the American Civic Association formed at St. Louis, Mo., June 10, 1904, by the merger of the American Park and Outdoor Art Association and the American League for Civic Improvement. The 'Prospectus' includes: Purpose of the Children's-Gardens Department, Educational Value of School Gardens, Work of the Department, Recent School Garden Publications.

"Under Work of the Department the plans are set forth as twofold: (1) to furnish information regarding school gardens, (2) to conduct an active propaganda for the extension of the school garden movement.")

CUMMINGS, HORACE: Nature Study Leaflets. Salt
1897 Lake City, Utah: University of Utah, State Normal School; Monthly leaflets partly devoted to school gardens, published from 1897–1902

DAVIS, J. E.: The Whittier School Garden. *The*
1902 *Southern Workman*, Vol. 31, pp. 598-603
1903 A Successful School Garden. *Country Life in America*, Vol. 3, pp. 192–194

FOWLER, W. K., et al.: The Model School, Home and
1902 Grounds, etc. Lincoln, Neb. Bulletin of State Department of Education, School Buildings and Grounds in Nebraska, pp. 102–134

GANG, E.: School Gardens. U. S. Bureau of Educa-
1899 tion. Report of Commissioner, 1898–99, Vol. 1, pp. 1067–1084

("This is translated from Rein's Pedagogical Encyclopedia. It is one of the best short accounts, especially from a historical standpoint, published.

Contents: Historical review; Sites and arrangement of school gardens; Different sections of school gardens; Management; Instruction in school gardens; Educational and economic significance of school gardens.")

GEORGENS, J. D.: Der Volksschulgarten und das Volks-
1873 schulhaus. Berlin. F. Henschel, 1873, pp, 6–190

("This was prepared by order of the Royal Land Commission of Prussia for the Vienna Exposition of 1873. It is of special interest because of its being one of the earliest books written on school gardens. Two pamphlets, however, in which school gardens received considerable attention, were published in Sweden previous to this time: Eckstrom, 18(55)56; Lindgren, 1866")

GEORGIL, AXEL: School Gardens in Sweden. U. S.
1900 Bureau of Education. Report of Commissioner, 1899–1900, Vol. 2, pp. 1447–1448

HATCH, L. A.: The School Garden at the Northern
1903 Illinois Normal School. *School News*, Vol. 16, pp. 466–467

HAYS, WILLET M.: Rural School Agriculture: Exer-
1902 cises in Agriculture and Housekeeping for

Rural Schools. Originally issued by University of Minnesota, Bulletin No. 1. Reprint by McGill, Warner Co., St. Paul, Minn. [1905?]

("Exercises in this Bulletin . . . have been prepared for use of teachers in the rural schools of Minnesota. Recognizing the unavoidable lack of preparation on the part of the teachers, each exercise includes the information necessary to the teacher conducting it. . . . The effort is to aid the teacher to lead the rural school pupils to gather facts, grasp principles, and receive impressions which will start them to earnestly study to improve the industries and life of rural communities.")

HIATT, EDWARD: School Improvement. Riverside, 1902 Cal., Department of Education. Riverside County, Cal., Leaflet, pp. 1–7

HOOKER, SUSAN H.: The Planting of School Gardens. 1902 *Country Life in America*, Vol. 1, pp. 219–221

HUNT, THOMAS: Rural School Agriculture. Columbus, 1903 O. University of Ohio, College of Agriculture and Domestic Science, University Bulletin, Series 7, No. 22, pp. 1–10

KARAL, JOHN: School Gardens in Russia. U. S. Bu- 1898 reau of Education. Report of Commissioner, 1897–98, Vol. 2, pp. 1632–1639

LATTA, W. C.: An Experimental Farm for Young 1898 People. Lafayette, Ind. Purdue University, Nature Study Leaflet No. 22, pp. 1–8

1898 Points for Young Farmers' Club. Ibid. No. 23, pp. 1–8

LE BERT, RICHARD: School Gardens in Europe. U. S. 1900 Dept. of State. Special Consular Reports, Vol. 20, Part 2, pp. 159–221

LUKENS, H. T.: School Gardens in Thuringia. *Educa-* 1899 *tional Review*, Vol. 17, pp. 237–241

McKay, A. H.: School Gardens. Halifax, Nova
1900 Scotia: Annual Report of the Public Schools of Nova Scotia, p. 27

1901 Agriculture, Nature Study, etc. Halifax, Nova Scotia: Manual of School Law, pp. 66–67, 77–79

1902 School Gardens, etc. Halifax, Nova Scotia: Annual Report of the Public Schools of Nova Scotia, pp. 3, 57–60, 73, 98, 105–106, 124, 128

Medd, J. C.: Rural Education in France. London.
1902 British Board of Education, Special Reports, Vol. 7, pp. 247–310

Niessen, Jos.: Der Schulgarten im Dienste der Er-
1896 ziehung u. des Unterrichtes. Düsseldorf: L. Schwann, 1896, pp. 9–176

("This is one of the latest and best books in German on the subject of school gardens. There is probably no better treatment of the subject to be found in any language. All phases are covered in a definite, practical way by detailed working plans.")

Parsons, Fannie G. (Mrs. Henry M.): The First Chil-
1903 dren's Farm. *The Outlook*, Vol. 74, pp. 67–72

Phelps, Charles S.: Agriculture for Teachers in Pub-
1903 lic Schools. Journal of Education, Vol. 58, p. 224

Poe, Clarence H.: Farmer Children need Farmer
1903 Studies. *World's Work*, Aug., 1903, Vol. 6, pp. 3760–3762

Powell, F. M.: School Gardens. Des Moines, Ia.
1899 Transactions of Iowa Horticultural Society, 1899, pp. 141–149

1902 School Gardens. Glenwood, Ia., Institute for Feeble-Minded Children. Institute Press, 1902, pp. 1–13

ROOPER, T. G.: The School Gardens at the Boscombe
1898 British School. London: British Board of Education, Special Reports, Vol. 2, pp. 224–231. Reprinted by U. S. Bureau of Education. Report of Commissioner, 1897–98, Vol. 1, pp. 224–227

1902 School Gardens in Germany. London: British Board of Education, Special Reports, Vol. 9, pp. 357–404

("An account of a few of the best German school gardens")

RULAND, KARL: School Gardens. (Translated from
1890 Kölnische Zeitung.) U. S. Bureau of Education. Report of Commissioner, 1889–90, Vol. 1, pp. 308–311. Article reprinted, Ibid., 1897–98, Vol. 1, pp. 224–227

SIPE, SUSAN B.: How the Children of the Franklin
1904 School in Washington Improved their School Grounds. *Country Life in America*, Vol. 5, p. 416

SKINNER, CHARLES R.: Surroundings of Rural Schools.
1903 Journal of Proceedings and Addresses of the N. E. A., 1903, pp. 89–96

SMITH, C. B.: A German Common School with a Gar-
1899 den. U. S. Dept. of Agriculture, Circular 42, pp. 1–7

1900 Agricultural Industries in France. U. S. Dept. of Agriculture, Yearbook, 1900, pp, 115–130

SMITH, H. W.: School Gardens and Agriculture.
1903 Truro, Nova Scotia: Annual Calendar, Provincial Normal School, 1903–04, pp. 13–14, 21–22, 33

SOUTHARD, LYDIA: School Gardens as an Educational
1902 Factor. *New England Magazine*, Vol. 26, pp. 675–678

TOLMAN, W. H.: Landscape Gardening for Factory
1899 Homes. *Review of Reviews*, Vol. 19, pp. 441–444

TOWNSEND, G. A.: The National Cash Register Boys'
1902 Gardens. American Park and Outdoor Art Association, Vol. 6, Part 3, pp. 27–31

TROOP, JAMES: A Children's Vegetable Garden. La-
1898 fayette, Ind. Purdue University, Nature Study Leaflet, No. 21, pp. 1–8

VAN DORN, CHARLES: Possibilities of a Country School.
1903 *School News*, Vol. 16, pp. 396–398

1898 Instruction in Agriculture in Rural Schools in France. U. S. Bureau of Education, Report of Commissioner, 1897–98, Vol. 2, pp. 1614–1621

1898 School Gardens in Europe. U. S. Bureau of Education, Report of Commissioner, 1897–98, Vol. 1, pp. 224–230

1902 School Gardens in Rochester, N. Y. *Country Life in America*, Vol. 1, April, 1902

6. ESSAYS—STORIES—POEMS RELATING TO A GARDEN

The following titles are merely intended to be suggestive to the teacher by broadening thought that centers in the garden work and offering frequent opportunities for new stories that shall give the children glimpses of the garden as a part of life and literature. The writings of Thoreau, Emerson, John Burroughs, John Muir, Schuyler Mathews, of Hamilton Gibson and Dr. Henry Van Dyke and others suggest themselves. Many of the nature study courses arranged by the educational departments of the different states give scattered poems such as those of Wordsworth, Shelley, Longfellow, Bryant, Whittier, Tennyson, etc. Some compilations have already been mentioned. The poems of Emily Dickinson and of Christina Rossetti hold numerous dainty, musical and ennobling sentiments touching on the garden. The Poetry of Nature, edited by Dr. Henry Van Dyke, prides itself upon selecting only those poems which are in all respects *true* to nature, though seen with the eye of the poet.

ARNIM, M. A. B. VON: Elizabeth and her German Garden. The Macmillan Co., New York, 1900

DELAND, MARGARET: The Old Garden and Other Verses. Houghton, Mifflin and Co., Boston, 1889

EARLE, ALICE MORSE: Sundials and Roses of Yesterday. The Macmillan Co., New York, 1902

Old Time Gardens. The Macmillan Co., New York, 1901

EWING, J. H.: Mary's Meadow, and Letters from a Little Garden. Little, Brown and Co., Boston, 1900

FLINT, M. B.: A Garden of Simples. Charles Scribner's Sons, New York, 1900

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